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The Use of Money in Business

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Are you a manufacturer or a speculator or do you do a little of both? When you have read this masterly article of Mr. Basset's you will probably have discovered several things about your methods of conducting business that will give you something to think about. The author's advice is sound, his remarks are very much to the point. Although some of the points he discusses are sore ones for many manufacturers just now, there is much to be gained by taking thought to the prevention of a recurrence of the troubles that now beset us.

WHEN a man in business needs money, his first thought is to borrow it. One may find elaborate treatises on business finance in which the whole subject is approached as though in business we dealt with money as such. One might infer that successful business somehow grew out of creating marketable securities, or forming sound financial connections, or in some other way closely linking banking and business.

Let us take business finance out of the marble halls of banking and see if more real financing cannot be done inside than outside the shop. Let us see if an insistent demand for money is an indication of prosperity, or an indication of bad business management which has confused the functions of business and of banking, or—further—whether the management, in a desire for easy money, has borrowed for speculation instead of for business processes.

Positive Rules Will Not Do

It will not do to put down positive and invariable rules; each case stands squarely on its own merits. This manufacturer may find that he is first of all a banker. He may find that his most profitable way of doing business is to lend goods over long periods. He may have a class of customers who want extremely long credits. Of course, one might say that his proper course would be to educate these customers into the use of short credit, but that is the counsel of perfection. No reason in the world exists why he should not extend one-, two- or three-year credits if, and this is the important point, he so organizes himself that the manufacturing and the banking phases of his business are not confused—if he remembers that he is appearing in two functions; first, as a manufacturer, and second, as a banker who lends goods instead of the money to buy them. His danger is in confusing the costs, the profits, and the losses of the two operations. Because the Germans worked out a right division of functions they were able to sell against all competitors in the long-credit markets such as Russia and South America.

Again, it may be the speculative feature that is of the highest importance. This is especially hazardous because speculation in materials is so often defined as "skilled buying." I know of hundreds of concerns with elaborate manufacturing and selling organizations that really depend for profit upon the ability of the executives to buy raw materials at a low price and sell them, slightly converted, at a high price. The maker of a product in which the value of the raw material is high as compared with the value of the labor finds himself burdened with all the problems of making and distributing, but dependent for his profits upon guessing the course of the raw material market. Most cotton-goods manufacturers are in this position; so are the makers of leather belting, of automobile tires and of food preparations. This entire class is apt not only to buy heavily against estimated needs in a rising market but also, when opportunity offers in such a market, to buy far beyond their needs in the hope of reselling the raw material at a profit. They thus mix the functions of manufacture and commodity speculation and because they make more money in trading with raw materials on a rising market than in manufacturing them, they usually get so deeply into the speculative side that they are caught with heavy inventories when the market turns.

Wise Speculators Get from Under

The wise speculators take their losses at once; the foolish ones, putting statistics against human trends, decide that the slump will be only temporary. They attempt to hold their stocks for still higher prices until finally they can no longer sustain their extended borrowing capacity and are compelled to unload at a crushing loss. There is nothing inherently reprehensible in speculation. In the end it promotes production and really equalizes prices over a period. The point is for the owners to decide whether they want to be manufacturers or speculators. If they decide that they are speculators the next decision to be made concerns whether or not it is economy to support a factory and a sales organization. They might do better to chuck those bits of trouble and take on a ticker service; why should a speculator have a high overhead?

Then we have the business which combines banking and speculation. The jobber often answers this description. A jobber is sometimes an industrial banker in that he finances both the small manufacturer and the retail distributor, but more often he is a speculator depending for his profit not upon a brokerage on the goods he handles but in buying them low and selling them high. Sometimes he has all of these functions. Likewise the retailer may be more of a speculator than

a merchandiser. Instead of putting his usual mark-up on a lot of goods that he buys at an exceptionally low price and thus getting a reputation for fair pricing, he may choose to put such goods into his warehouse in the hope that he can sell them later in a higher market.

Most of the dangers in business finance arise out of putting the speculative side above the fabricating or merchandising. It is just as dangerous for a corporation to speculate in goods as to speculate in the stock market; in many ways it is more dangerous because very few staple markets are nearly so well organized as is the stock market and hence one cannot often get so quickly out of goods as out of stocks.

Strictly Business or Strictly Speculation?

The first policy, therefore, to be determined in any business institution is whether the strictly business or the strictly speculative feature shall dominate. One or the other should dominate, but often I wonder, in observing the demands of some concerns for money, whether their executives and bankers realize this self-evident fact. How often do corporations ask aid to help carry speculative purchases that are disguised in the statement of condition as "raw material," "goods in process," or "finished product." I will commonly take a large inventory not as an evidence of forehandedness but as an evidence of possibly unconscious speculation.

The divorce of manufacture and speculation would go far toward the stabilization of industry. The present policy is unscientific. A manufacturer will commonly offer his wares for future delivery at a price which he arrived at by guessing the course of the raw material market. If, at the time of delivery, the price of the raw stuff has gone down then he will try, by curtailing production, to keep up the market price on the finished product so that both he and the customer may get out at the price quoted.

From time immemorial manufacturers have met in solemn conclave and decided officially or unofficially, according to the legal advice that they received at the moment, to maintain prices by curtailing production but they have never made a nickel by so doing. Were it not that so few of them know the cost of manufacture and especially the cost of idle plants they would not cling to that ancient notion—a notion that comes down from the days when plant investments were small.

So when we talk about financing operations of this sort, dignified as a rule under some phrase that contains a note or two about "steadying the market," we are not really having much, if anything, to do with business. We are rather finding satisfactory excuses for sending good money after bad. When a concern fails because of its inability "to carry" its inventories, frankness should compel a somewhat different verdict running more to the effect that the company had bet on the wrong horse.

Manufacturing and Selling Do Not Mix with Speculation

The mixing of manufacturing and selling with speculation is the greatest of all deterrents to sound business practice and organization. It is the function of a manufacturer to manufacture, of a merchandiser to merchandise. They should look for their recompense to the results of the skill with which they perform their functions. Their profits per dollar must necessarily be small—and arduously earned. They cannot expect to become millionaires over night. It is hard for men pursuing this conservative course to see others come into the market and, without manufacturing or merchandising skill, clear stupendous profits merely by buying low and selling high. If a market, during a considerable period, continues to rise one will find very few business men who are able to keep their heads and to remember that a day of reckoning is inevitable. Almost without exception they will cast aside the principles upon which they built business and engage in a mad scramble of speculation.

We have just been through such a period. Business economics have been thrown aside. Suggestions or rules for financing a mixture of business and speculation are not any more useful than rules for beating roulette wheels. The way to finance speculation is to borrow all the money you can and keep on borrowing as long as you can. If, during the progress of the borrowing, you can sell your goods then you can pay off your notes. If you cannot get rid of your goods and the banks refuse to renew the notes, then the approved course is to authorize an increase of capital stock and try to work that off on somebody. If there are not enough fools around to buy your stock certificates and nobody will take the goods off your hands, why then you are what is termed unfortunate, and you fail. If, in addition to being a speculator, you are also blessed with a benevolent disposition, you will gracefully try to get your employees in on the stock subscription. This latter form of benevolence has not been wholly overlooked.

Money Not the Only Remedy in Over-expansion

In the inevitable depression that follows a period of undue prosperity and speculation, the over-extended speculators usually fail. The survivors gather to learn what business is and to study the use of money in business instead of in speculation. But so deeply ingrained is the thought that business somehow depends upon money instead of money upon business that a deal of unnecessary attention is still devoted to getting money—when money is not to be had. For instance, I found one large company badly in need of money—so it thought. But an investigation and study of their situation made it appear that what they needed was more method in the shop and less activity in the banking department. They had a goods-in-process inventory of $4,000,000; half-finished goods were everywhere in nooks and corners waiting for some department of the factory to turn out the missing parts. A thorough revision and planning of their schedule of output and a co-ordination of their plant cut down the inventory to $1,000,000. They borrowed all the money they needed right from themselves not only without interest but with a premium in addition in the way of lessening their costs of production! They had been giving their attention to finance instead of to manufacturing. They had held with so many others to that compressed bit of unwisdom which is expressed in:

"Money makes the wheels go round."

Does it? And what of it if it does? That is not business. Business is not simply the stimulation of the motion of wheels; it is a result of the motion of wheels. The wheels going round make money. It is only in the unsuccessful business enterprise that money makes the wheels go round—or, putting the whole less cryptically, we may go into business because we have money

(and undoubtedly we need money before we can go into business), but we cannot stay in anything that may properly be described as business unless money results from our operations.

The whole thought of business enterprise is clouded by failing to grasp the real part that money plays. We get to thinking in terms of dollars instead of in terms of goods. Manufacturing is only a process of converting goods. At one end of the shop we take in raw material, add to it labor either in the form of handiwork or in the form of machine work, which is only the previously accumulated hand work, and then turn out at the other end of the shop, our raw material plus all of this labor and try to make an advantageous exchange of this, which we call our product, for more raw material, and for food, fuel, clothing and housing, to recompense ourselves and those who have labored with us in the transformation of the raw into finished material.

Why Money Is Necessary

Because the direct exchange of what we make for what we need is quite too cumbersome a process we use, instead of the goods themselves, accepted exchange equivalents which we think of as money and which are expressed in terms of money but which, as a rule, are in the form of credit instruments—the bank notes of governments, or the promises to pay of individual institutions.

If we kept strictly to the practice of exchanging goods for goods, a proprietor and his workmen would not eat until the goods they made had been exchanged, unless at some previous time the proprietor had exchanged his product for enough food to build up a surplus to tide over the next trading period. In such case he would not need any elaborate accounting to discover whether or not he was conducting business at a profit. His stomach and the stomachs of his workers would give a quick and accurate statement of business condition. The business man would be in exactly the same position as the Indian trapper who brings his pelts to the trader and receives return in kind, or of the small cotton grower who exchanges his cotton with the local storekeeper for such of the necessities of life as he cannot produce on his own farm.

Instead of this seemingly simple, but actually rather complex, process of trade, we first substituted the more convenient medium of money, but finding even that less arduous method of actual exchange of goods for goods too awkward, we have practically substituted credit in many forms, and it is the management of this money and credit which created that department of business which we term finance.

Finance, then, is not that which causes business but is only the management of the value representations of the various goods and services that go to make up business. This is simple, elementary economics—so simple and so elementary, indeed, that it would be unnecessary to set it forth as a background of finance were it not that we have fallen into the habit of approaching business with the thought uppermost that it is money that makes the wheels go round. Then we quickly lose ourselves in a technical maze of financial principles expressed in financial jargon. One can be an extremely good business man without knowing the difference between a promissory note and a trade acceptance, or between a bond and a debenture, or between a bank and a trust company, or even between a bill of exchange and a check, or between a gold brick and a gilded brick. It is true that a capable business man whose mind was blank on these subjects might have not a little difficulty in retaining the results of his business capability, but most people have difficulty in doing that anyway and I am not sure that the man who is successful in business without the slightest knowledge of finance as applied to other than his own immediate concerns is not safer with his pile than is the equally successful business man who sets up later as a financier!

One of my friends who is a lawyer asserts that a great boom would come to the legal profession if only a book instructing every man on how to be his own lawyer could be widely circulated. For then a resurgent passion to dabble in the law would arise and instead of simple and inexpensive cases the lawyers would have great and complex ones!

Borrowing Ability Not Indispensable

Because of this wrong approach, of this notion that it is money that makes the wheels go round, we find those who have acquired a reputation for financial acumen in business get it as a rule because of a certain skill in borrowing money, which connotes an acquaintance with bankers and banking methods. These are valuable additions to the mental equipment of any man in business, but too marked a proficiency is apt to be evidence—as uncanny skill with a billiard cue is evidence of a misspent youth—of a misspent business life.

Any man with a pleasing personality, a knowledge of bankers and banking conditions, and a certain deftness in the formation of financial statements, can borrow money. If he extends his acquaintance among bankers he can borrow to meet his borrowings and thus acquire the essential reputation of meeting his notes. And he can do all of this honestly, for it is easy to persuade oneself that every cent borrowed will in time be returned. And then quickly and insensibly, one may be caught in the endless chain system of finance.

This is a soul-racking method of prolonging business life and depends solely upon being able to borrow increasingly large amounts of money. It is the certain road to ruin and only rendered more certain by the occasional earning of large profits that enable the overextended margin of indebtedness to be cleared up. Because a bank will commonly lend between four and five times the amount of a depositor's daily and average balance is no assurance to the borrower that he will be able to repay. The bank works on a law of averages. The borrower works on his individual productiveness. His average cash balance has nothing to do with his own true estimate of condition and while borrowing to pay off former loans is at times inevitable, its necessity is always carefully to be analyzed. Adopting the Ponzi financial system is easier than one imagines. Not a few people have made comfortable livings out of borrowing money but do not let us confuse respectable panhandling with business borrowing, and do not let us get business borrowing out of its really very subordinate position in truly productive activity.

Managing Ability More Important Than Financial Dexterity

Business is not founded on financial dexterity; it is founded solely on the management of production or merchandising. If you call the roll of the great business men of the country you will not discover one who is, or was, pre-eminently a financier. They are super-

latively skillful in either production or merchandising—never in finance. I do not recall a single business institution that was built by a financier. A. T. Stewart, Marshall Field, and John Wanamaker built as merchandisers; P. D. Armour based his success on being able to get more out of a hog than the hog's anatomy could reasonably be expected to deliver; Carnegie was a maker of steel and a manager of men—so is Schwab; Gary is a manager of corporations; Ford is a maker of automobiles; and so on through the list. J. P. Morgan, who organized more corporations than any other man in the country, would never under any circumstances put a financier at the head either of a railroad or an industrial enterprise.

Money does not produce goods; goods produce money. The process of finance is, then, merely to see that enough money is produced through the exchange of the articles manufactured to pay for the purchase of new raw materials, labor and depreciation of plant with enough over—that is, enough profit—properly to recompense those who initially ventured their money.

We have two general divisions of money in business—that which represents capital—the means of production, and that which represents goods in process. It is only as we confuse these two classes of money and confuse their relations to what we are doing that we get into financial trouble.

The part of the capital which is represented by the means of production is commonly termed the fixed capital while that which is involved in the goods in process is the working capital. The line between the two is not distinctly marked and their functions are so interdependent that neither is worth much without the other.

Fixed Capital the Stake of the Owners

It has been the practice in the past to regard the fixed capital and a portion of the working capital as the stake of the owners and then to go out and borrow in a temporary way the additional working capital that may from time to time be needed, and it has been considered conservative, legitimate business management to borrow money whenever that borrowing will result in the production of goods that will turn into money.

Take first the fixed capital. We are not concerned here with the legal organization or the nature of the instruments that the contributors of the initial capital get in return for their money except to point out that mortgage bonds or any form of obligation which puts a lien upon the property of the company and fixed charge upon the earnings is extremely dangerous. The safety of a mortgage upon an industrial corporation has been overestimated; the investor should want earning power—not something he can sell. He does want earning power but a mortgage often, in the early years, destroys the chance to obtain earning power, and so the investor gets only an opportunity to join in a reorganization. A well-equipped manufacturing plant should be so special in its construction that it will have little or no value when sold at a forced sale. If it is large it cannot be sold anyway. It really has to be reorganized and the bondholder must get, of the securities issued in the reorganization, somewhat less than he held in the first place. The best financial plan is that which involves only common stock of no par value; the next best plan, and the one, for sales reasons, which is commonly adopted is to issue preferred stock, with or without a convertible feature and to sell a certain amount of common stock in the same package.

But with this side of finance I am not concerned. The amount of the fixed capital—the amount of the total resource—which is invested in assets that have to do with production is the paramount concern. The plant has to be profitable and it cannot be unless it is fitted to its work. Its fitness is not to be arrived at by guessing. The factory itself will be built to obtain a certain planned output in the most economical fashion. The plan will contemplate increases in productive capacity with the increase in market and these additions will go on as complete units—not in haphazard fashion.

Do Not Expand Too Much for Emergency Orders

The cost of plant will, therefore, have a direct ratio to planned sales; the sales necessary to operate the first unit to capacity will be known and additional units will be added only as orders over a considerable period give a fair certainty that the additional demand will be stable. It is hard to turn down orders in boom times, especially when prices are high, but the wise financier will not extend his plant to meet emergency orders. Good manufacturing depends upon continuous capacity output—upon being busy in so-called dull times. Adding capacity to take care of the order peak means that normally the plant will not be running at capacity and hence will not operate with the planned economy and at the planned costs. After every boom period we see magnificent plants that cannot produce cheaply enough to find large markets simply because of the heavy fixed charges for idle plant. Of if the idle portion of the plant is not charged into the overhead it has to be taken out of the profits made by that portion which is working, with the result that profits are depleted to the vanishing point.

I am not advocating a cheap plant—I am urging the kind of plant that can turn out goods with the minimum of cost—the eventually, not the initially, cheapest plant. We base a new plant on the work it is to do—it is a tool and we need just the right size of tool and no other. We are setting out to do a certain job—to make a certain amount of product, and we expect to make it so well and at such a price that it can be sold. The amount that it will cost to buy that exact tool is hence known to us in advance and that will be the amount of capital that will have to go into the fixed division.

In the old plant the general rule holds—transform it into a tool for the work that it must do. Any plant that has not been scientifically designed or in which the work and methods are not planned and the labor is not co-ordinated, can commonly be increased from 25 to 50 per cent or more in capacity by the adoption of modern methods of routed work and instructed labor. I have assisted in cases where we have taken an old plant, rearranged the machinery, then installed a planning board, properly instructed the employees, and have not only decreased the cost and increased the volume of production but have been able also to lease part of the property that was formerly thought wholly essential. This gained an outside revenue which considerably decreased the burden of the overhead expense.

Manufacturing Efficiency the Goal

The point is to get everything into the plant that will lessen the expense of production and to get everything out that tends in any other direction. In short, the amount of capital to be tied up in plant and machinery is first of all an engineering and sales affair and only secondly a question of finance. If one has not the

money to do the job as it should be done then the decision has to be made as to whether or not a compromise is worth while. The horse may pull through even if lame, but a wise driver rarely starts on a long trip with a lame horse.

Now we have decided on a certain volume of output. The tools to fabricate that output will cost an amount we have ascertained. The next point is to determine how much money it will take to send the materials through our course of fabrication—that is, how much money it will take to buy the various kinds of raw or semi-finished material that enter into our product, to pay the wages of labor in the making, to pay all other charges, and to keep on paying until the customers to whom we have sold have paid their bills. This makes necessary a considerable number of important decisions. We will have to know what credit will be extended to us in buying and what credit we shall extend in selling. Picturing the production of the factory as a wheel, a single revolution of which represents a day's output, we shall have to determine how many revolutions of that wheel will take place before we begin to be paid for what we do. We shall have to advertise, pay salesmen, and incur many and various sorts of expenses before, under the most favorable circumstances, we can expect to earn a profit. All of these expenses may be tabulated, they may be put into a budget and their sum will determine the minimum amount of working capital.

New Company Should Have a Year's Reserve

If the product and all of its processes of sale and distribution have been scientifically worked out the chances are that the company will make money, but just as a salaried individual is not to be considered in good circumstances until he has enough money in reserve to support himself for a year without working, so a company beginning business should be in a position to call upon enough money to keep itself going through at least a year without making money. Although it is presumed that all of the plans will have been worked out with a maximum of human skill that does not of itself absolutely guarantee success. One must be prepared against contingencies, and be prepared to meet these contingencies not by borrowing but by the acquisition of additional capital.

We can borrow to finance operations, but borrowing to meet depletions of capital or for any capital purpose holds within itself the highest danger, for we may thereby begin that endless chain system of finance that must end in absolute ruin.

I have given no figures as to the relative size of the fixed and the working capital and it must be apparent that to settle upon any such arbitrary figures is only to assert that the business has not been previously planned and that its most important factors are being left to guesswork. Neither have I dealt with the borrowing policy because that is really a question of planning—not of finance. Neither have I taken up the case of the older corporation that finds itself in financial difficulties. The arrangement of its finances does not in the least differ from that of a corporation starting in business. And finally I have offered no suggestion as to how to get along without money for the excellent reason that there is no such method—that is a question of individual genius.

The whole point that I want to make is that the management of finance is a question subsequent to and not precedent to the management of production.

Keeping Presses At Work With Oxy-Acetylene

By I. B. Rich

No matter how perfect the design or how good the material, the shocks and stresses to which a crank press is subjected when used day after day on production work, seem to start, or perhaps to develop, cracks which occasionally let go and put the press out of commission. Accidents of this kind seem bound to happen at the most inopportune times when the press is particularly needed. The long delays which have been necessary in

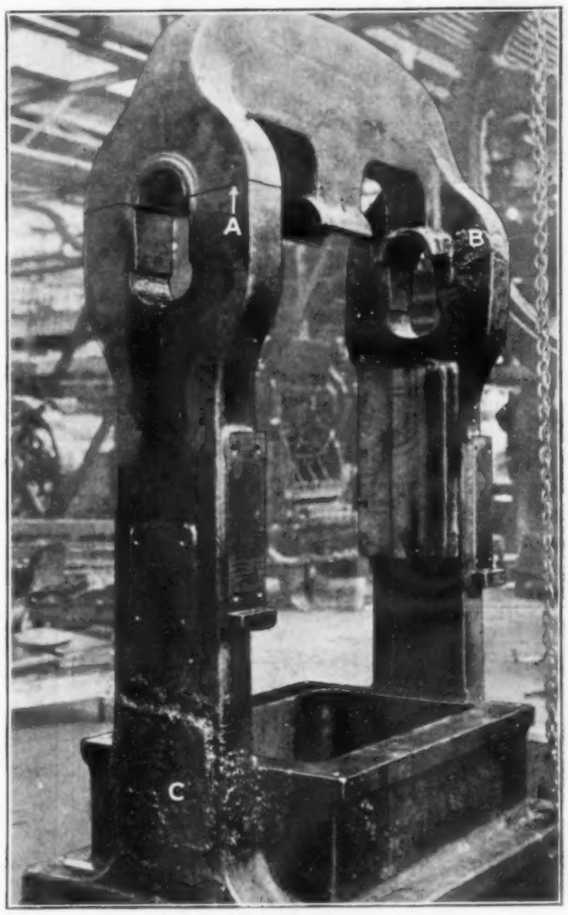


FIG. 1. THE THIRD BREAK

the securing of new machines or new parts are probably responsible for the development of the system of repairing broken press frames which is described in this article. The judicious use of oxy-acetylene welding has enabled presses to get back on the job at a much earlier date than would have otherwise been possible. The examples shown herewith are from the shops of the Michigan Stamping Co., Detroit, Mich., and the results secured were largely due to the activities of Oscar C. Bornholt, then production manager of the plant.

Fig. 1 shows a typical break in the press housing at *A* and also that a similar break has previously occurred on the other side at *B*, while the large patch at *C* indicates clearly that at least two previous breaks have been repaired and the machine put back into commission. It is noticeable that in no instance has the next break occurred at the weld.

Fig. 2 shows the welding of the housing shown in Fig. 1, and incidentally the method used in cases of this

FIG. 2. PRE-HEATING AND WELDING

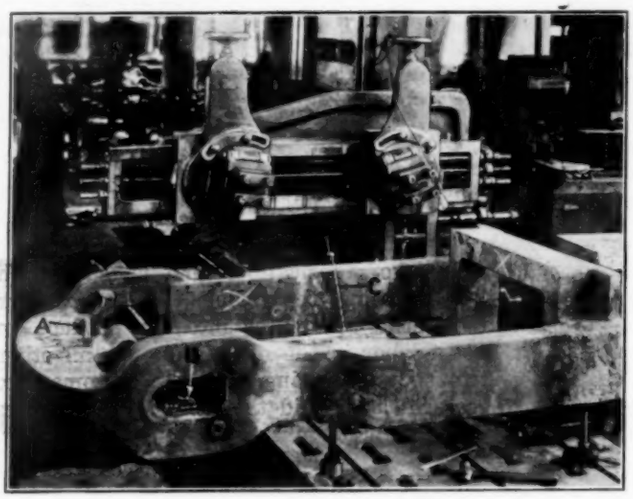


FIG. 3. PLANING THE FRAME

kind. The frame was laid on its side and a temporary furnace built around it with firebrick loosely laid into the desired shape. A good charcoal fire was then built on the metal plate which forms the base of this impromptu furnace and the frame thoroughly preheated before welding was attempted. When the frame was heated to the desired point the welders set to work as shown and welded and built up the frame in accordance with previous experience.

In one instance a press of somewhat greater capacity was needed and none could be secured, the difficulty was met by cutting the original frame and welding on new sides of the desired width and length. This made four different welds but the work was successfully accomplished. Fig. 3 shows the frame mounted on the open side planer for machining. Great care was taken in lining up the frame, the levels at *A* and *B* and the surface gage at *C* being an indication of the methods used. Fig. 4 shows the press again mounted on its legs and ready to be put into commission.

That this kind of repair work was not confined to smaller presses can be seen from Fig. 5 where a very heavy machine broke through the bearing section of the housing. Only two of the repaired breaks are shown at *A* and *B*, but four different welds were required to put the machine back in commission.

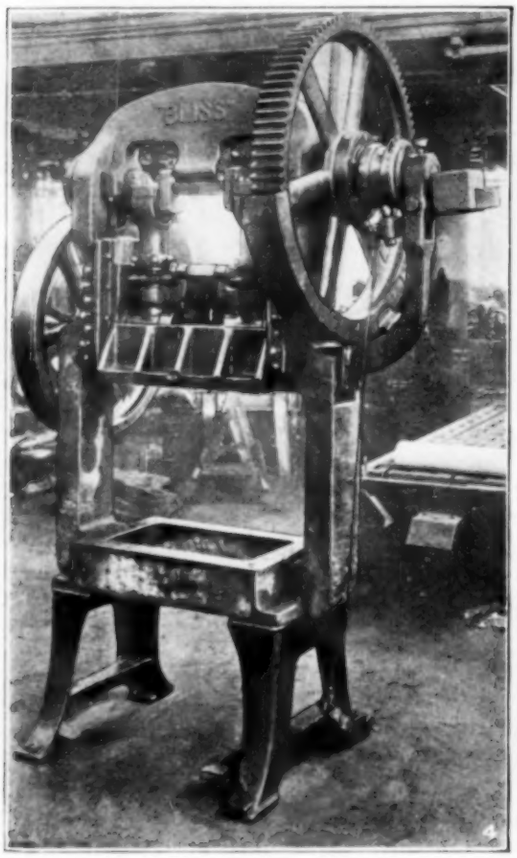


FIG. 4. THE WIDENED PRESS

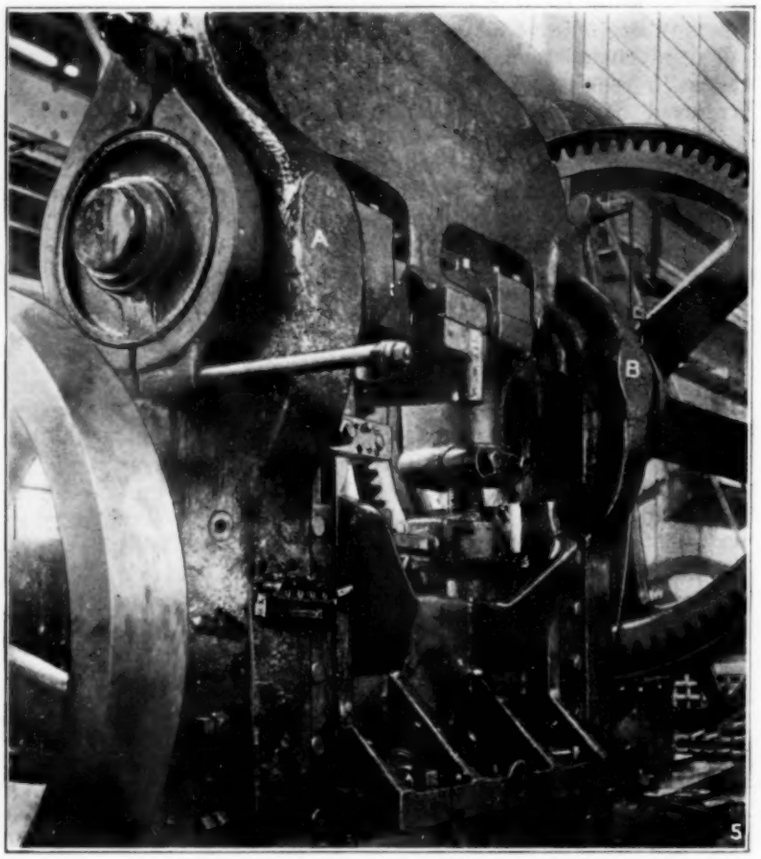


FIG. 5. A LARGE PRESS REPAIRED BY WELDING

Two Light Punching-Machine Jobs

By JOHN SIMON
Vienna, Austria

The tooling arrangements for punch-press work shown here come from Austria, and give an idea of what is done there in the way of special tools for particular jobs. Both of the arrangements given are for high speed on very light work, and they show ingenuity on the part of their makers.

THE accompanying illustrations, Figs. 1 to 3, show a die for punching out small plates used in a common type of fuse for electrical circuits. These plates are fastened to the silver wire in the fuses, their purpose being to show whether or not this wire is melted out, since they drop out of position when the wire melts. One of the plates, which have holes punched in the middle and resemble copper washers, is shown in Fig. 3.

Fig. 1 shows the die, which was made in the following manner: After planing all surfaces, the die plate *A* was laid out for punching twelve plates at one stroke of the press, two sizes of holes being needed. In order that the plates and scrap could fall through the die easier, it was milled out from the back side, which also makes it easier for the diemaker to drill the holes when the die is not so thick. The larger holes were bored out. With the help of a drill jig the small holes were drilled and then taper-reamed from the back. The plate was then hardened and ground.

As can be seen, the gage plate *B* was made longer and screwed to plate *D*, in order to give more feeding surface for the stock. After this, the close-fitting stripper plate *F* and punch plate *H*, Fig. 2, were bored through the die plate *A*. Then the guiding plate *G* was made to fit the head *J*.

At first we worked on a press with a 10-mm. stroke. Of course, the punches always came out of the stripper and wore themselves off when entering into it again, so that with time they became dull and broke off. In order to overcome this trouble we made the head *J* with a T-slot 12 mm. high through it. The part *K* was turned so that the end was 6 mm. smaller than the T-slot itself, thus reducing the stroke of the punches to 4 mm. and leaving them always in the close-fitting stripper.

The side punch *C*, with a length *L*, cuts the stock 1 mm. narrower, thus giving a means of determining the proper distance for feeding the stock forward against an edge on the plate *B*. Fig. 3 shows a piece of punched-out stock. The difference in the width of the stock before and after punching should be noticed. With this die we had good results, making easily 12,000 pieces hourly.

Die for Forming Fuse Caps

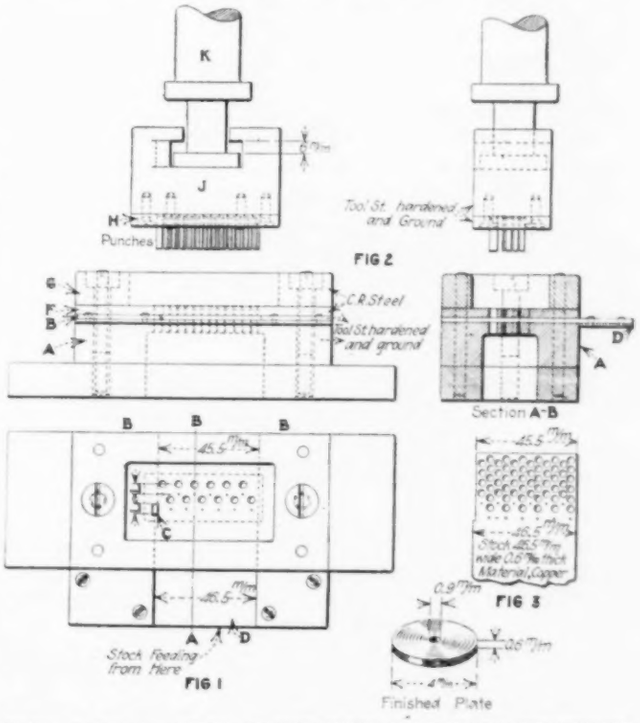
In Figs. 4 to 8 is shown a die for making the small caps for these same fuses for general use in electrical work. It is an interesting combination die that performs progressively piercing, embossing, engraving, cutting out and drawing operations. It works very well producing 4,500 pieces hourly and making three finished caps at one stroke of the press to the shape and dimensions given in Fig. 4 (a high degree of accuracy not being required). Fig. 5 shows the general plan of the die. Fig. 6 shows a section through the die on line *AB*, and also a section through the punch above it, showing how the various punches are held in the plate *O*.

As can be seen, the die uses the principle of the side-cutter *S*, which cuts a length of 22.5 mm. at each stroke, making the stock 1 mm. narrower. By this means, proper locating is obtained by feeding the punched edge of the stock forward against a shoulder on the gage plate *B*.

The first operation performed is the breaking through (not punching) of the small 0.8 mm. hole with the needle *N*, thus leaving no scrap in the inserted die *D*. This operation is followed first by the embossing, done with the shoulder of the needle *N* in the die *D*, and secondly by the engraving or lettering die *M*. Next, the stock is pushed 22.5 mm. forward, bringing it over the form *E* under the embossing punch *L*, which "draws in" the stock a little. This operation is necessary in order to insure that after the drawing operation the caps will be straight on the top.

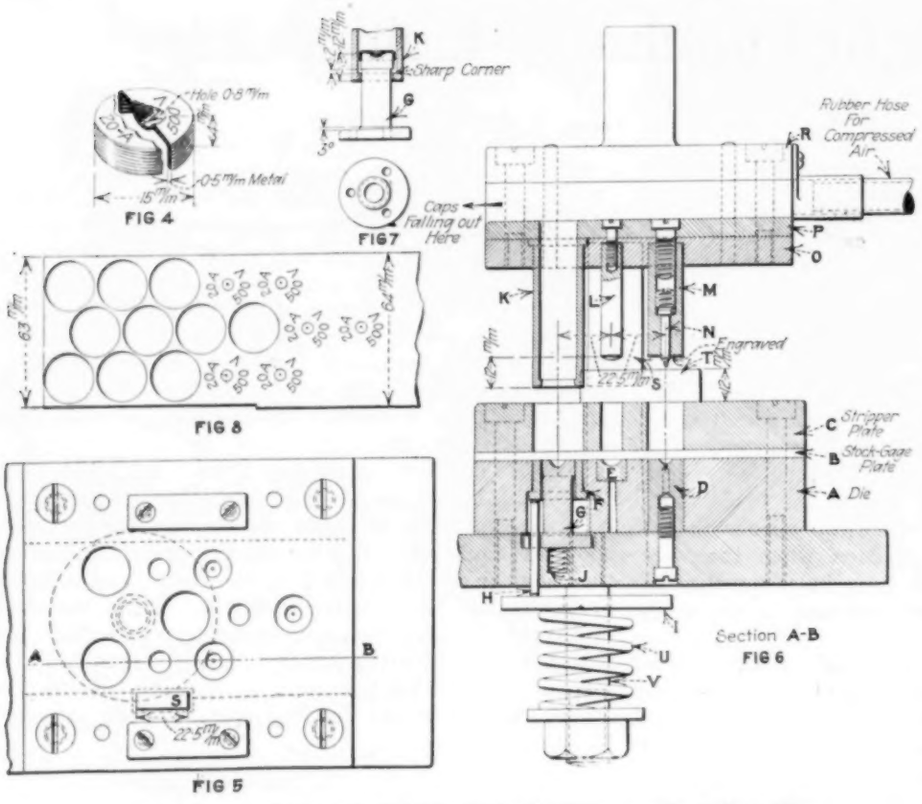
Drawing and Stripping Caps

The final operation is the cutting-out and drawing, which is done by the punch *G*. Drawing die *K* holds the finished caps, one on top of the other, until they rise up to the level of plate *P*, where compressed air blows them into a box. In Fig. 6 is shown the drawing punch *G* with its stripper bushing *F*. This bushing rests on the pins *H*, which hold the stripper flush with the cutting level through spring *U* and washer *I*.



FIGS. 1 TO 3. TOOL EQUIPMENT FOR GANG-PUNCHING SMALL PLATES

Fig. 1—Die for holding work. Fig. 2—Punch, showing lost-motion device. Fig. 3—Punched work.



FIGS. 4 TO 8. TOOL EQUIPMENT FOR FORMING CAPS FOR FUSES

Fig. 4—Fuse cap completely formed in press. Fig. 5—Plan of die. Fig. 6—Section through punch and die. Fig. 7—Method of stripping caps from drawing punch. Fig. 8—Punched out stock.

In Fig. 7 is shown the drawing die *K* entered into die *A*, the depth of entering being limited by the blocks *T*, Fig. 6, when they touch the surface of the plate *O*. Furthermore, the blocks do not allow the damaging of the engraving punch *M* and the needle *N*. In order surely to strip off all the finished caps, the sharp corner of the drawing die *K* must pass the larger diameter of the drawing punch. The punch is then lifted by the little spring *J* underneath it, so that the eccentrically turned flange rests against the bottom face of die *A*. This tilts the punch to one side and thus gives the sharp corner the opportunity to catch the edge of the cap and strip it from the punch as the ram of the press rises.

In Fig. 8 can be seen a piece of stock from which some caps have been punched, the difference in the width of the sheets being clearly shown. It will be noted that there are three sets of dies acting simultaneously, which accounts for the large production.

A Simple, Accurate and Easily Made Pantagraph

BY E. A. DIXIE

We had a number of flat hardened steel gages to mark. Ordinary hand etching was not good enough because of lack of uniformity as the gages were in lots of thirty or more of the same size. The man in charge of the job sent out inquiries with the result that a machine suitable for the work could be bought for $800 and delivery might be made within six months.

As the job would hardly stand an additional expense of $800 and the customer positively would not stand for six months delay we decided to build some sort of a makeshift ourselves.

An order was therefore issued to one of the tool-makers to make a pantagraph which would be good enough to do the work but that no extra time be spent on making it pretty.

The pantagraph, the entire cost of which was less than $75, is shown in Fig. 1. Fig. 2 shows two samples of its work, one of letters in five reductions from a model having letters $\frac{3}{8}$ in. high; the other of figures, in five reductions from a model $\frac{1}{2}$ in. high.

The machine as shown has six possible changes of size but other sizes can be obtained by the simple drilling of two $\frac{1}{8}$-in. holes and the drilling and tapping of two holes for 10/32 screws.

Some ingenuity was displayed by the man who made the instrument. He selected four long and two short pieces of $\frac{1}{8}$ by $\frac{3}{4}$ in. cold-rolled flat steel for the main members. As each of the four long members has a plain end and a yoke end, he got out eight short pieces of the same stock to form the yoke ends. As the simplest way to make the yoke ends was by brazing, the following method was pursued:

One of the long pieces had two of the short pieces clamped to one end of it as shown in Fig. 3, the short pieces projecting beyond the end of the long piece suf-

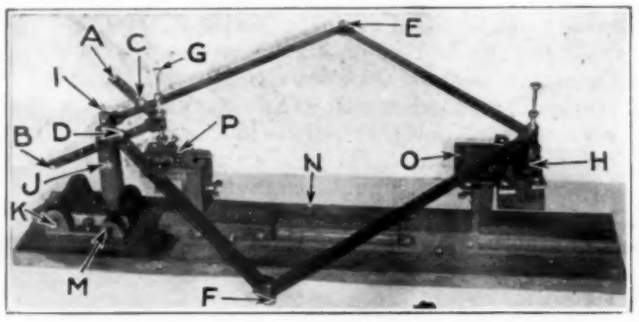


FIG. 1. THE COMPLETE PANTAGRAPH

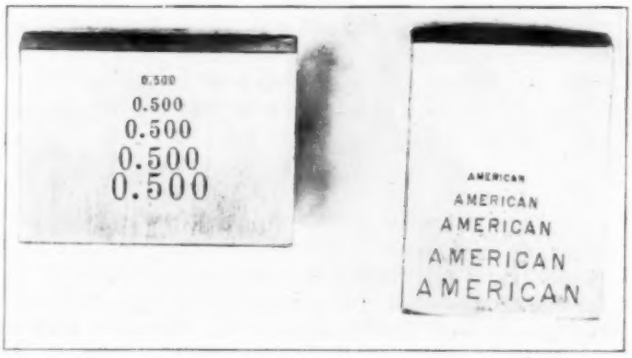
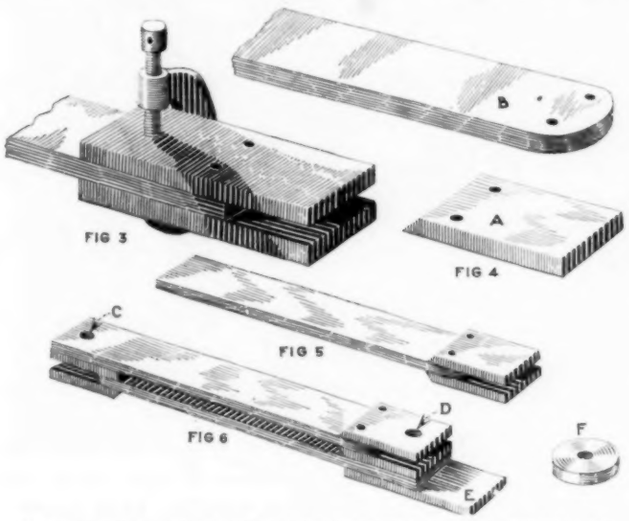


FIG. 2. SAMPLES OF ETCHING

ficiently to form the yoke end. Two holes about ⅛ in. in diameter were then drilled through all three pieces so that they could be riveted together later on. In a similar manner the other three long pieces were assembled each with two of the short pieces and the rivet holes drilled.

The inner ends of the short pieces were then cham-



FIGS. 3 TO 6. HOW SOME OF THE PARTS WERE MADE
Fig. 3—Building up the yoke. Fig. 4—Parts rounded and chamfered. Fig. 5—Yoke end ready for brazing. Fig. 6—One member used as a jig.

fered and the end of each of the long pieces rounded as shown at *A* and *B*, Fig. 4, after which the pieces were assembled as shown in Fig. 5 and the rivets driven to keep the assembly together during the brazing operation. The yoke ends were brazed in the blacksmith's fire in the usual way, using soft yellow brass wire and boric acid so as to avoid hard scale.

After brazing, one of the long pieces was laid off and the ⅛-in. holes *C* and *D* drilled in each end, as shown in Fig. 6. This piece was then used for drilling the three other pieces. Under the one end was placed a packing piece of ⅛ x ¾ in. cold rolled flat as shown at *E*.

Two washers *F* were made of tool steel and hardened. These were ¾ in. in diameter by about ⅛ in. thick and each one had a ⅛-in. hole in it. Placing one of them on each side of either the yoke end or the plain end of the long pieces and passing a ⅛-in. bolt through they were used as a filing jig to round the ends off.

Drilling the Small Pieces

The small members *A* and *B*, Fig. 1, were made in the same way as the long members. These and two of the long members were then drilled for the screws *C* and *D*. The screws are simple shoulder screws with heads ¾ in. in diameter. The bodies of the screws are ⅛ in. in diameter and the threaded ends 10/32. The holes in *A* and *B* were drilled ⅛ in. and the holes in the long members drilled and tapped 10/32. The adjustment or proportion holes are spaced about an inch apart. A simple jig was made from a piece of cold rolled steel for this purpose. It had only two holes in it and was stepped along from hole to hole after the first two holes were drilled.

The joints *E* and *F* are held by special ⅛-in. bolts. A small pin through the head of each bolt and into the yoke end prevents the bolt from becoming loose. The follower *H* and the stylus *G* are made of ⅛-in. drill rod. They are held by hollow members, shown in Fig. 7 at *B*, whose outsides fit the holes in the yoke. The top and bottom ends of the hollow members are split and tapered so that nuts will clamp both the stylus and follower securely when they are once set.

The pantagraph is carried on a pin *I*, Fig. 1, which is a turning fit in the member *J*. The member *J* is pivoted at *K* so that when the follower *H* is lifted out of the model the stylus *G* also lifts.

A setscrew *M* can be set so as to limit the amount of lift of the stylus.

The base *N* is cast iron about ⅜ in. thick. Its dimensions are given at *A* in Fig. 7.

The bracket *O* carries the model letters or figures to scratch on the work with the stylus. It is a sliding fit on the dovetail on the base. A setscrew is provided to secure it in place when set.

The bracket *P* carries the work. It is also adjustable on the base and secured in the same way. A detail of the brackets is shown at *C*, Fig. 7.

Clamps are provided on both the brackets for holding the model and the work.

Operation of the Follower

The work is varnished with spirit varnish made by dissolving gum guaiacum in denatured alcohol. This varnish dries sufficiently in a very little time. The work is then clamped in position and the follower is dropped vertically into one of the letters or figures of the model. The operator runs the follower several times over the whole letter or figure, lifts the follower vertically and drops it into the next, and so on. If the model is made deep enough the operator need not be careful to lower and lift the follower vertically for with a deep model when the follower is out of the impression the stylus is clear of the varnished surface of the work. With a little practice an operator can scratch three lines of etching having about ten letters each in less than two minutes.

A 25 per cent solution of nitric acid and water is then applied to the work for from one to five minutes, depending on the depth of etch required. If the work is en-

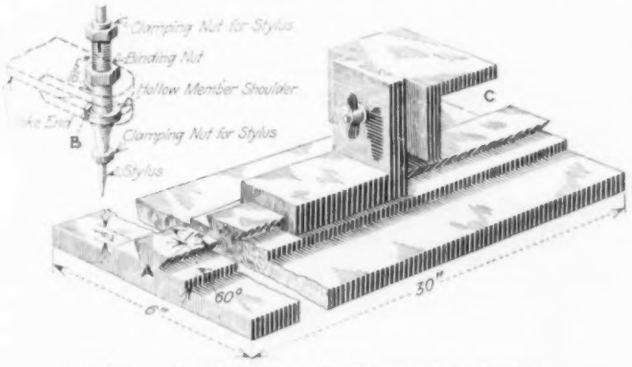


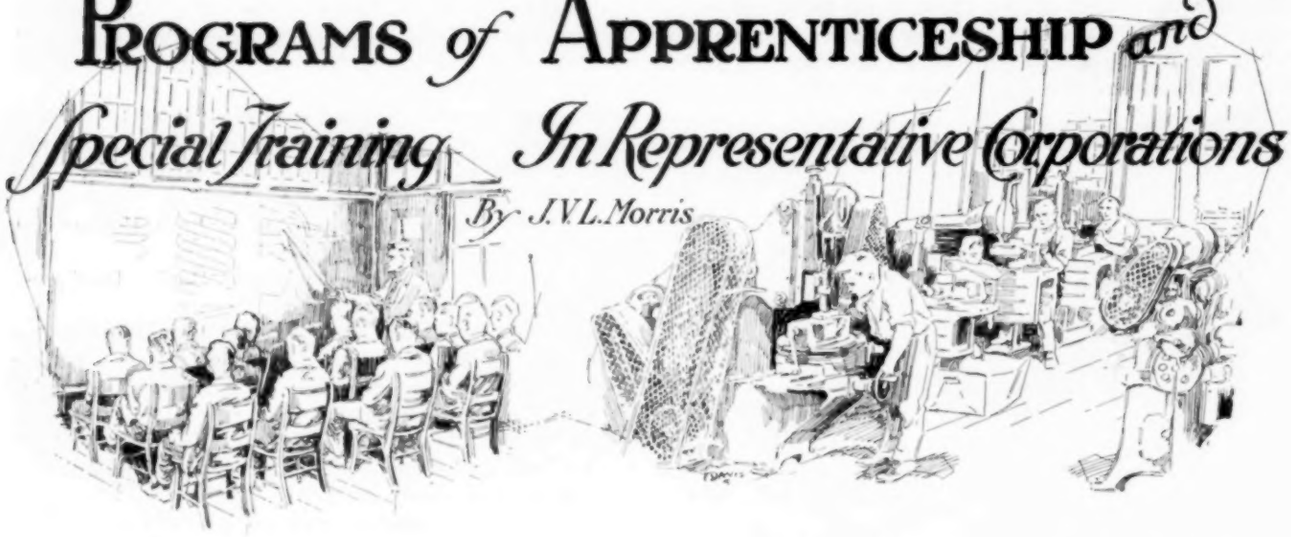
FIG. 7. DETAILS OF SOME OF THE PARTS

tirely covered with the varnish it can be immersed in the acid, if not, the acid can be applied with a medicine dropper. When the acid has bitten in to the required depth the work is immersed in strong soda water to "kill" the acid. It can then be put in denatured alcohol and the varnish will wipe off clean.

Work should be scratched within an hour or two after it has been varnished as the varnish is apt to become hard and brittle and flake off if it stands too long before it is scratched with the stylus.

Programs of Apprenticeship and Special Training In Representative Corporations

By J. V. L. Morris



THE De la Vergne Machine Co. offers an excellent opportunity for the study of apprenticeship as applied in a plant of comparatively small size. About 200 first-class machinists are employed here, with forty apprentices in this trade. This number includes twenty-five toolmakers, in which special branch there is only one apprentice. Also, supplementary to the twenty patternmakers are three apprentices. It is thus seen that a standard ratio of one apprentice to five journeymen is maintained in the machinists' trade and of about one to eight among the patternmakers. The products of the plant are oil engines and ice machines, the manufacture of which offers ample variety of experience at the standard machine tools, on the test floor and in assembling. This no doubt accounts for the fact that a system of apprenticeship has been maintained since the occupation of the present plant in 1898.

VI. The De la Vergne Machine Co., New York

The time-honored system of apprenticeship with some new features in instruction seems to be the most popular form of trades education that really provides a thorough training. The method of training apprentices in a small plant where the problem is not particularly complicated is shown in this article, the plan of instruction, both in the shop and in the corporation school, being taken up.

(Part V was published in the Nov. 18 issue.)

The apprentices are under the general supervision of the assistant production manager, who is a young mechanical engineer, and seemingly well fitted to handle the school which is provided to supplement the practical work. To insure proper supervision of shop work the apprentices are grouped under selected gang bosses in the ratio of about one boss to six apprentices. A schedule card is kept of each apprentice, assignments being approximately as follows: As tool boy, 25 to 30 weeks; at cold saw, not more than ten weeks, but eliminated altogether for most boys; progress through different engine lathes (Fig. 29), 40 weeks; Gisholt turret lathe (Fig. 30), 20 weeks; drill press, 20 weeks; milling machine, hand, 4 weeks, all sorts (including universal), at least 20 weeks; shaper or planer, 10 weeks; bench work and assembly, 10 weeks, but if the apprentice shows an aptitude and inclination to become a mechanical engineer, 25 weeks; boring mill (Fig. 31), 10 weeks; test floor, if machinist, 15 weeks, but if specializing on gas engines, 30 weeks; at forge and

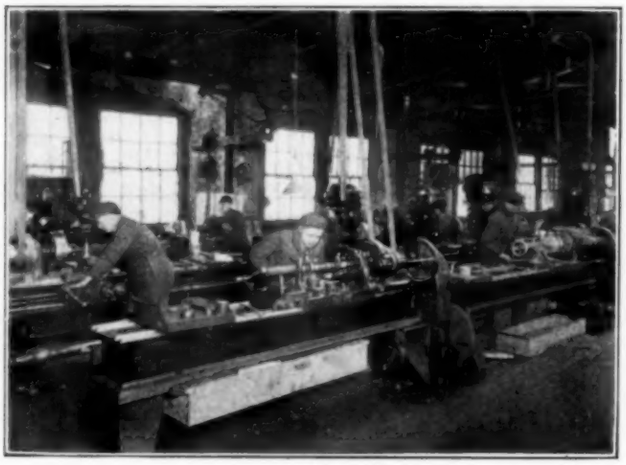


FIG. 29. APPRENTICES AT WORK IN LATHE DEPARTMENT

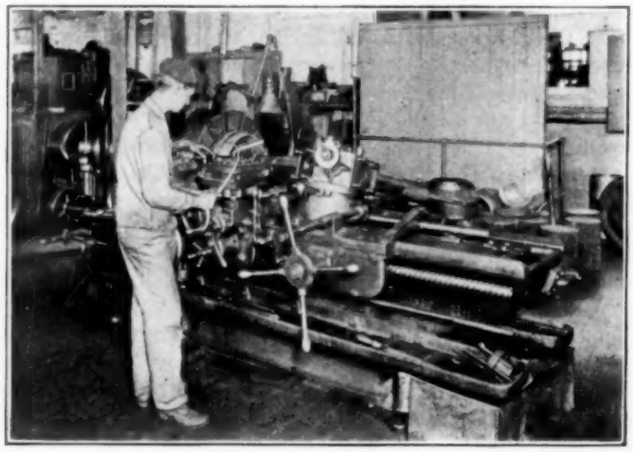


FIG. 30. APPRENTICE OPERATING A TURRET LATHE

FIG. 31. APPRENTICE RUNNING A BORING MILL

steam hammer, 5 weeks; and in the foundry, 3 weeks. Regular periodical ratings are made of progress in the shop work as regards workmanship and deportment, and in the class work in mathematics and drawing. Fig. 32 shows the form of the card used for recording this information.

For the class work the apprentices are divided into two groups of about twenty each, two hours a week being devoted to regular assignments in the excellent texts at present available in shop mathematics, and a second two-hour session being given to drawing. As there is considerable variation in the advancement of the apprentices, the instruction of the advanced students is largely individual, though the four hours of school are required of them just the same as for beginners.

Pay of Students

The compensation of apprentices reflects the improved rates of pay of machinists. As recently as 1917 the apprentice started at 8 cents an hour with two-cent increases every six months to a maximum rate of 22 cents. The rate now starts at 26 cents with increases every three or every six months, reaching a maximum of 44 cents in the last period of the fourth year. Fig. 33, showing the other side of the card in Fig. 32, gives these rates. Upon graduation a certificate is conferred, a bonus of $200 is paid and advancement is made to first-class journeyman's rating.

Another phase of employee instruction provided in this plant has been voluntary trade extension classes held after working hours for the adult workers. These are not in operation at the present time owing to lack of available space for holding them, but they are to be resumed in the early fall.

The method of administration is worth noting, as it seems to have met with general satisfaction. It consists in placing the responsibility for the conduct of the apprentice system in the hands of a committee of three members, made up of the works manager, the supervisor, who is the assistant production manager, and a journeyman machinist in the company's employ, regarding whose choice the apprentices were consulted. This committee passes upon the apprentices at the conclusion of the trial period and signs the agreement then entered into, as also does the boy, his parent or

	Weeks	Check Number	DATES From	DATES To	Math.	Dwg.	Industry	Workmanship	Department	
Tool Boy	36									
Cold Saw	10									
Lathes	60									
Drill Press	12									
Milling Machine	30									
Shaper	10									
Bench	10									
Boring Mill	10									
Floor and Assy.	20									
Gishott Lathe	10									
Tool Maker	11									
	288									

E-Excellent 90-100% G-Good 80-90% F-Fair 60-80% P-Poor Below 60%

Average for 4 Years

Final Grade

FIG. 32. CARD USED FOR GRADING APPRENTICES

Surname Given Name Address

Reg. No. Parents or Guardian Address

Application Received Engaged Left Rejected Discharged

Contract Signed Deposit Received Finished Apptc'ship. Released

Nationality Date of Birth Place of Birth

Education

PERIODS AND RATES PER HOUR

	1st 26¢	2nd 28¢	3rd 30¢	4th 32¢	5th 34¢	6th 36¢	7th 38¢	8th 40¢	9th 42¢	10th 44¢
When Rate is Scheduled to take effect.										
When rate did take effect										

REMARKS

FIG. 33. RECORD CARD FOR APPRENTICES, SHOWING WAGE RATES

guardian and the general manager, as representative for the company. It may also recommend changes in the procedure of apprenticeship, and in general it provides a clearing house for the discussion and initiation of any new features in the program.

The *esprit de corps* of the apprentice department is also promoted by encouraging athletics. Each season the boys have their baseball, football and basketball teams, in which considerable interest is taken by the management.

The general impression gained of the apprenticeship system offered by the plant is that the boys' interests are being considered, and that from the standpoint of the company apprenticeship is abundantly justified in spite of the relatively small number that can be provided for.

Folklore Philosophy

BY A. M. SIMONS

Every people has one set of folktales that turn about the antics of the village fool. Along with this goes another set that pokes fun at stupid people who expect, by shrewdness, to get something for nothing.

One such very old American tale that came down to me through a line of New England ancestors, illustrates both phases. It tells how a Yankee schooner was wrecked on a desert island, barren even of vegetation. Here the narrator stops for the fool to ask, "How did they live?" Then comes the brilliant repartee, "They all got rich taking in each other's washing."

Students of folklore know that such stories persist through the centuries only because they strike at deep-seated, universal weaknesses in human character. The reason why millions continue to smile, even faintly, at each re-telling is because each of us thinks of someone they hit. One reason, besides their antiquity, that keeps the smile faint, is the suspicion that the moral may hit us.

"HELP WANTED" ADS AND "EXPERIENCE"

Every time I look at the "Help Wanted" columns I know one good reason why this particular folktale does not die. Fully three-fourths of the advertisements call for "experience." Perhaps one in fifty offers to supply experience.

The vast majority of employers expect to get rich by stealing experience from each other. Of course they do not succeed, any more than the sailors in the story. Nevertheless, like the village fool, they continue to "bite" at the old "catch." They are unable to see the defect in the logic.

Is it not about time to learn the moral of the old folktale in this field and to know that there is no way to get more experience out of the labor supply than is put into it? This carries the other lesson that those who put experience worth having into labor are apt to get the benefits of it. Firms and nations with training systems and technical schools are able to retain such of their workers as are worth having. Labor is an attribute of human beings and humans prefer, with other getting, to get understanding, and will stay where they can get it.

Firms who give least valuable experience, and employees who absorb least are the source of most of the experience which is available to advertisers. In business we deal with large masses and majorities, not with exceptions. Those who have had experience at one job and are seeking others are most often products of defective jobs or defective abilities, or both. In either case it is an least as probable that his experience should render the person an object of suspicion as of acceptance. Experience alone will never be a reliable qualification until it is possible for sailors to get rich taking in each other's washing.

KNOWLEDGE AND EXPERIENCE

Industry seeks knowledge, not experience. It is true experience is a school, though a hard one. But the important question is the possession of the knowledge, not the way it was obtained.

The moment there is any method of testing knowledge experience ceases to be a criterion of ability. Testing substitutes knowledge for guesswork on the part of the employer, and we are learning that here also exact methods of investigation and recording facts are of much more value in hiring than long experience in "judging human nature" by mystical "hocus pocus."

When we are able to determine the thermal units in coal we quit asking our neighbor what has been his experience with different kinds of fuel. As soon as a method is found for determining abilities and rating production, experience becomes of less importance in making up the qualifications of employees.

"What about the man who knows all about a job but can't fill it?" asks someone who has not yet learned that things equal to the same thing are equal to each other. The answer is, "There ain't no sich animile." The entire personnel department of the American army thought there was. So did the similar departments of the British and the German armies. They hunted through millions of men to find him. He was not there. Whenever a man was found who knew all about the job he could do the work. If he had years of experience and did not know about it, he could not do the work.

These armies spent millions of dollars and thousands of lives finding out this fact. But they did find it out. Industry has probably spent much more in the same search but has not yet entirely discovered the fact.

KNOWLEDGE IS POWER

Whether the man got his knowledge in schools, out of books, in the shops or by inspiration ceased to interest the examiners. If he knew, he could do. They learned over again, as we seem compelled to learn every truth over and over again, that "knowledge is power."

Civil service examiners learned the same lesson long ago. They tried hiring people who said they had done the required work and had experience. The results were uneven and unsatisfactory. After a while they found that the important question was not how long a person had been to school, but how much he had learned; not how long he had worked at a trade, but how much he had learned.

Employers seek experience, only because they do not know how to measure knowledge. Every time they advertise for experience they also advertise the fact that they have no means of finding out whether an employee is really competent.

When we get out of the folklore stage we will establish training systems and technical schools to put the knowledge into the labor supply and then analyze our jobs to determine the knowledge they demand and, finally, develop tests to find out whether the proposed employee possesses the knowledge.

Modernizing Locomotive Terminals*

BY G. W. RINK

Engine terminals play an important part in the operation of the railroad, as the transportation department is at all times entirely dependent upon them for its supply of serviceable power for the movement of both passenger and freight cars. Should the capacity of the terminal or the facilities for making repairs be inadequate, the result will soon reflect itself in more time being required to prepare engines for service and more frequent detention on the road due to failures.

THE general layout of engine terminals, also the extent of shop facilities provided, depends entirely on their location with reference to the general locomotive repair shop. When located in close proximity it is necessary to provide only such facilities as may be necessary to make the general run of roundhouse repairs, depending upon the main shop for the manufacture and supply of a large percentage of materials required for use at the terminal. But when engine terminals are located some distance from the general locomotive repair shops, they should be provided with enlarged facilities so as to perform all the necessary machine, blacksmith, and boiler-shop operations required when making more extensive repairs, and be entirely independent of the main shop.

The location of the engine terminal with reference to the general locomotive repair shop will have some bearing on the necessity of performing relatively heavy repairs at the terminal. Where they are within reasonable distance of each other, it may be desirable to have a considerable part of the heavy repair work transferred to the main shop, where the repairs can be performed more expeditiously and the engine returned to service.

The arrangement of tracks at the engine terminal, including inbound and outbound tracks, will depend entirely on the location of available space assigned. The successful operation of the terminal requires a complete analytical study of the entire project from an operating standpoint, taking into consideration the number and type of locomotives to be handled and the possible future increase in requirements.

With reference to existing terminals, a careful study of the property will no doubt disclose the fact that improvements can be made whereby greater efficiency may be obtained. Modern facilities should be installed wherever it is possible to produce a saving in time and labor. Special consideration should be given to the various items which comprise the terminal. The type of house, number of stalls, and number of single or double houses will have to be determined by a careful study of the conditions to be met, such facilities as will work out to the best advantage being installed.

Coaling Stations and Sand Storage

The type of coaling stations selected must depend on the number of engines handled, the number of tracks which may be available for coaling engines and the kind of coal to be handled. Some roads in the East use bituminous, broken anthracite, and buckwheat. Where the quantity of coal handled is small, the locomotives can be coaled from an elevated platform using one-ton buckets or by means of a locomotive crane direct from car. When it is necessary to deliver coal to two or more tracks, a mechanical type of coal-handling apparatus is generally installed. Marked improvements have been made in receiving, hoisting, and distributing equipment, which has resulted in smaller operating forces being required. Measuring devices are also installed for recording the amount of coal delivered to tenders. An electric winch should be provided at large terminals at the loaded coal-car track so that cars can be hauled to position over track hopper.

The sandhouse should be located at the coaling station. Sufficient wet-sand storage space should be provided as well as means for drying the sand by coal stove or steam. Compressed air should also be available so that the sand can be delivered to overhead storage bins, having suitable outlets to deliver the sand direct to engine by gravity. All important engine terminals should have a complete installation of this character.

Ash Handling

At small engine terminals provisions are made to handle cinders in various ways. One method is to provide a pit located between rails, the cinders being shoveled to track level and loaded into cars by hand or locomotive crane. This system is satisfactory where but few engines per day are handled.

During recent years the tendency when constructing large terminals has been to install pits filled with water. The cinders drop directly into the water and move toward the center of the pit, due to the outer wall sloping inwardly, and are removed either by a locomotive crane or by an overhead crane traversing the entire length of the cinder pit, the cinders being deposited by means of grab buckets directly into cars located on the loading track.

Steam-jet ash conveyors can be installed to advantage where ample supply of steam is available. The system consists of an 8-in. cast-iron pipe made exceedingly hard to withstand wear, with intakes provided at suitable intervals. The cinders are drawn by suction through the main pipe line and then propelled by means of the steam jet direct to car or storage bin, suitably located.

Turntables

The length of turntables installed is generally governed by local conditions, also type and wheelbase of locomotives to be turned. The usual length is 100 ft., which is ample in all cases except where large Mallets are handled, when it is desirable to provide 110-ft. tables to insure greater leeway for balancing the locomotive under all conditions.

Inspection pits are now being installed at a number of large engine terminals. These are located on the inbound tracks with the view of making inspection of locomotives before they are placed over the cinder pit. Fires can then be withdrawn when the engines pass over the cinder pit, if inspection develops defects which warrant this procedure, thus saving time and expense in-

*From a paper presented at the annual meeting of the American Society of Mechanical Engineers, New York, Dec. 7-10, 1920.

volved if the engine was inspected within the roundhouse after passing over cinder pit.

Heating and ventilation are of first importance in a modern and efficient roundhouse. With the possible exception of small isolated houses in mild climates, where sufficient natural ventilation can be obtained, a properly designed system combining heating and ventilation should be adopted.

A combined heating and ventilating system should supply sufficient air for the quick removal of smoke, gas, and vapors. Ventilating sash, louvers and other openings should be provided at the high points of the room to supplement the forced system by directing the flow of air currents and facilitating the removal of hot gases. This feature should be carefully considered, for in roundhouse ventilation it is not so much a question of diluting the air as it is of establishing a positive flow of air which will carry the gases along with it.

Adequate daylight facilities through large window areas together with light, cheerful surroundings are highly desirable.

Much needed improvement is desired in connection with artificial lighting of engine terminals. In the roundhouse proper, lights mounted on the outer wall and reflected between engine pits have given satisfactory results when augmented by sufficient lights suspended from the ceiling to afford general illumination.

For lighting the roundhouse circle, flood lights should be used whenever possible, as general illumination will add considerably to the safe movement of locomotives to and from turntable and engine house. Ashpits can be illuminated by rows of reflector lights placed on poles, and similar provision should be made at other points beyond turntable or by the use of flood lights on the top of coaling stations.

Facilities should be provided for washing out boilers, using hot water under pressure and refilling with hot water after washing.

Hot-water washout and refilling systems can be economically installed in any size to meet the requirements in any engine terminal of moderate size. The usual practice is to deliver washout water at temperatures varying from 100 to 140 deg. The refilling water generally has an average temperature of approximately 210 deg.

Screw-jack locomotive hoists especially designed for unwheeling locomotives are being more extensively used at engine terminals, and their use has made possible a large saving in both time and labor. These hoists operate with a high degree of safety as compared with the drop-pit system; furthermore, they can be located within the roundhouse or installed in a separate building, in which case it would be desirable to also install the wheel lathe and other tools and appliances for taking care of heavy running repairs.

Space for blacksmith and boiler shops is generally provided adjacent to the machine shop. Facilities should include steam hammer, forges with down-draft hoods (number and size to suit work to be performed), punch and shear, plate-bending rolls, straightening plate, flange fire, etc. Stock flues, sheet iron and bar iron and steel should be kept outdoors in covered racks.

Autogenous cutting and welding outfits are also considered indispensable and are used principally in making repairs to locomotive fireboxes, engine frames, and in reclaiming miscellaneous parts which can readily be repaired by this process.

Oil houses should be separated from other buildings, should be of fireproof construction, and of a size to suit the requirements.

The storehouse should comprise a structure of ample size, conveniently located to machine shop, with platform and track facilities for handling material to and from cars, building provided with sufficient natural and artificial light, steel shelving, bins, etc., separate alcove for electrical repair shop and provision for office staff on second floor.

Important engine terminals should be provided with a power plant of sufficient size to take care of the future as well as immediate needs of the terminal. In a number of cases this plant is required to provide steam for thawing snow at switches on main-line track leading to the terminal passenger station and supply heat and light to station buildings, and function in general as a service station.

Acme Threads in Motor-Jack Bushings

By A. J. Schwartz

The article on page 397 of the *American Machinist* on "Tapping Acme Threads in Motor Jack Bushings," by H. W. Armstrong, is of value in that it gives information on how to increase the production of the bushings, and at the same time decrease the cost for taps. It is with pleasure that articles on the subject of Acme threads are read, particularly when the faults in manufacture are cited and the remedy given to overcome them by some one engaged in actual manufacture and thus qualified to give additional information. A few more dimensions on the drawings of the taps would, however, be greatly appreciated.

Will Mr. Armstrong kindly supply the readers with a little more information in respect to the exact dimensions for the perfect threads on the tap and also the theoretical dimensions of the thread in the ¾ in., 4 pitch, bushings this tap is to produce?

It is to be supposed that in this age of interchangeability the bushings are made within certain limits of tolerance and that "go" and "no go" gages are used to check the work; therefore, there must be a point at which the taps will cease to cut to the proper size and should be discarded. Now as the minimum hole for screw thread product is considered basic and required by the United States government, it would seem advisable and desirable to make the taps slightly over-size by a few tenths, or even a few thousandths of an inch, and it is information in regard to the amount of over-size on all dimensions of the tap that is desired.

There is no reference in the article to the screw that is to fit in the bushings, nor information regarding its manufacture, but for quick assembling, the mating parts should have ample initial clearance or allowance, as otherwise, unnecessary time will be consumed in putting these parts together. Assuming the bushings produced by the taps to be in agreement with the theoretical thread data as given in the "American Machinist Hand-Book," it will be absolutely necessary to make some departure or deviation from this data when making the screw, as it is impossible for the 4-pitch Acme thread bushing to go over a screw having exactly the same dimensions except for clearance at the major diameter of the bushing and the minor diameter of the screw.

If it is possible to do so without giving away the firm's secrets, I would, therefore, request that the basic dimensions and the tolerances for a ¾-in., 4-pitch Acme thread screw be given to the readers.

Making Eccentric-Headed Studs

BY FRANK S. WARD

The manner in which eccentrically headed studs were made in an English munition plant is unique enough to warrant examination. The ways in which the speed of production was increased without the use of automatic machines show that there are probably large possibilities of improvement in regard to rate of production in the average machine shop.

THE making of eccentric-headed studs on a large contract presented some interesting problems to the shop which undertook the job. The contract called for 10,000 studs, more or less. The material, which was furnished by the buyer, was 3-per cent nickel steel. The only machines available were 14-in. swing hand-lathes. That is to say, the spindle of such a lathe was belt-driven, the traverse driven by hand only, and the slide-rest, though adjustable along the bed, possessed no saddle. The operators were girls.

As it was impossible to cut off in the lathes, the stock was sawed off into pieces the length of two studs with a minimum allowances of $\frac{1}{8}$ in. for cutting them in two. As the bars were just over $1\frac{1}{4}$ in. in diameter and as the pin had to be 1 in. in diameter, eccentric to the extent of $\frac{7}{64}$ in., there was not much material to waste. The heads were not turned, as they had to be milled later to a special form.

At first the job may strike the reader as very ordinary, but he will find, the author has reason to believe, that the procedure has in it not a little of the new. Although an ideal turret-lathe job, it was done in comparatively light lathes at a pace that the turret lathe had hard work to beat.

PECULIARITIES OF THE JOB

On this particular job, turret-lathe users had one trouble to face which they surmounted only by running the spindle at a comparatively low speed. Imagine the effect of running at a high speed a 12-ft. bar of $1\frac{1}{4}$-in. steel set eccentric nearly $\frac{1}{8}$ in. The price paid for the studs was very low and those firms that followed the ordinary practice of cutting off and turning the studs between centers lost money. One or two small firms went "broke" with the job.

By making the job a chucking one, we saved at least $\frac{1}{4}$ in. of material on each stud and about 1,000 lb. of metal altogether. Centers could not be left in, which is one item of interest. Another item is the use of a universal chuck without any alteration for chucking eccentrically. The author conceived the idea of inserting the jaws in the chuck in the wrong order just to see if the right amount of eccentricity could be obtained, or so close an approach to it that the jaws would not require much grinding. As luck had it, it was found that the roughing operation, illustrated in Fig. 1, about cleaned the stock up all around. Occasionally, a little black was left on at A which, however, never failed to clean off at the finishing cut. This idea may afford to someone else the opportunity of avoiding the use of special eccentric chucks for similar jobs.

The way we avoided length stops may not be without novelty. In addition to the turning tool *B*, we fixed in the rest an ending tool *C* and provided a gage *D* to facilitate setting the tools the proper distance apart. The operator had instructions to level up the end, removing a minimum amount of metal, a means whereby we were enabled to reduce the cutting-off allowance. A trial proved the impossibility of truing up the end to the center, there being too much vibration.

Now, at the outset, I started with the impression that the tool, if made as for turning tool steel, would be about right for 3-per cent nickel steel. Consequently, the top rake adopted was 10 degrees. After a little experience our girls were averaging about 8 ends per hour. Naturally, we had not aimed at a high surface speed for we regarded the material as requiring approximately the same speed as tool steel. A coolant was not used at first, but after pumps had been fitted, we found higher speeds possible and the output went up to some 10 an hour, and there was not a little saving in tool-setters' labor.

CHANGE IN TOP RAKE

This continued for some time, when some fool of a tool-setter, having run out of the ordinary tools, inserted one of our standard tools, such as used for soft mild steel and having a top rake of 35 degrees. That day the output showed a considerable increase, so great an increase, indeed, that a reason was sought and, of course, found in the tool. Without burdensome explanation, we must say that after a little experimentation we found it possible to nearly double the speed, and that enabled the operators to double the feed without feeling increased fatigue. Our average production went up to 21 ends an hour and our record to 27, inclusive of toolsetting time. A section of the cutting end of the tool is shown.

A minor point that is worth while talking about arose. We found that there was less tendency for the tool to dig in when it was set well below the center. When set above the center this type of tool, if it yields,

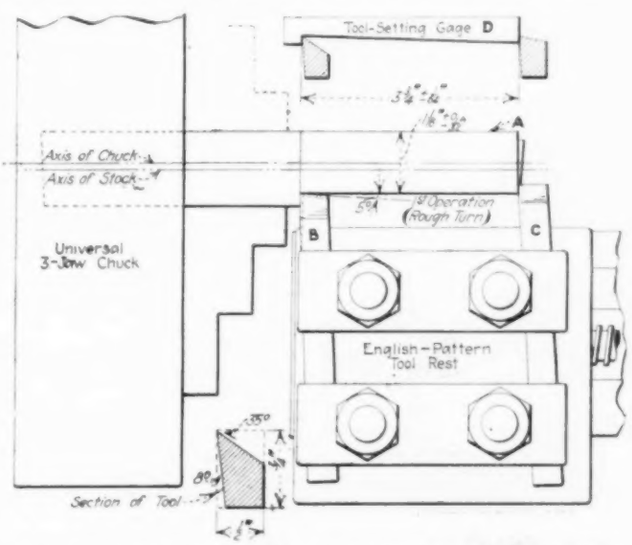


FIG. 1. FIRST OPERATION, ROUGHING ONE SHANK

digs into the parts being reduced. Again, by setting the tool below the center, the length of cutting edge in action is slightly increased.

Two lathes were employed for roughing. The first operation was roughing one end eccentrically, Fig. 1,

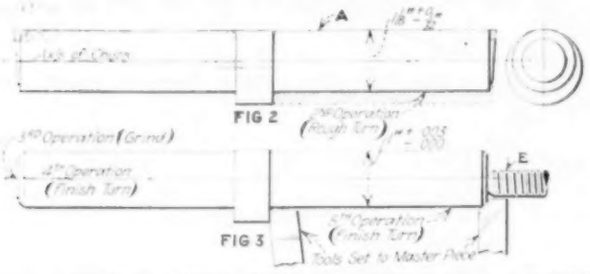


FIG. 2. SECOND OPERATION, ROUGHING OTHER SHANK
FIG. 3. FINISHING THE STUDS

leaving from $\frac{1}{32}$ to $\frac{1}{16}$ in. for a finishing cut. The blank was then transferred to the second lathe, see Fig. 2, in the chuck of which the turned end was held concentrically. When a line of black had been left at *A*, it was always set against a jaw. A blank that happened to be a little small (the bar being undersize) was in this way frequently saved, if not at both ends, at least at one end.

Facing and Finishing Turning

The next operation, Fig. 3, was the grinding off of the unlevel ends. It was concluded that a little time would be saved owing to one handling only being needed, instead of the two required if this process had been left until the pieces were cut in two. In grinding, the pieces were simply rolled on a flat rest across the face of the wheel, the finishing of each end occupying but a few seconds.

The fourth and fifth operations, finish turning the ends, were practically repetitions of the second, the ends however, being chamfered instead of merely leveled. The output was about 24 an hour. In this case the top rake of the tools was 15 deg. only, but a coolant was used as before. An end stop *E*, Fig. 3, was attached to the top slide (the toolslide) of the rest.

It might be well to explain here that the output was increased a little by replacing the handles of the slide-rests by longer ones fitted with heavy balancing balls, which enabled the operator with a spin to return the slide to its starting point. With the short handles, roughing was very hard work.

Sawing

The arrangement for sawing is not without interest. The bush illustrated in Fig. 4, of mild steel case-hardened at the right hand end, was recessed to a depth equal to the finish length of the head. The saw attendant had instructions to allow the saw to touch the bush lightly. It was impossible to saw off so that the heads came too short, and they were generally a little too long, or rather longer than the nominal. Only rarely was it necessary to face the inner stud to length, and the finish as left by the saw was good enough. The inspector, after sawing, set aside the studs with long heads for facing, which was a simple lathe operation unless the amount to be removed was excessive. In that case, the stud was returned to the saws and the excess sawed off.

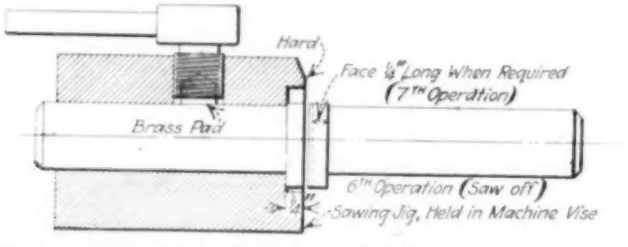


FIG. 4. MEANS OF HOLDING THE WORK WHILE SAWING STUDS APART

One would imagine that the rubbing of the saw against the hard bush would be detrimental to saw life. It may have been, but if so, the loss was quite inappreciable. What was more important, our lathes were enabled to earn more than could possibly have been lost on extra saws.

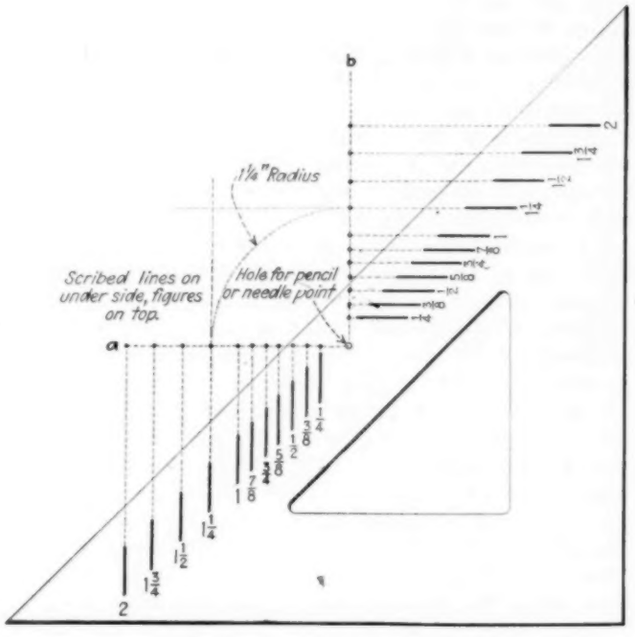
The average time per stud for all the operations except sawing was 7 minutes. Those who recognize the stud will be interested to learn that, together with the operations not described, the total time worked out at 12 minutes each—with poor machines.

Locating the Center of Radii

By Chester E. Josselyn

There are two methods in common use for locating the center of radii on a drawing. One is to set the compass to the required radius and then make several guesses at the center, usually getting it somewhere near right; and the other is to measure off the distances with dividers and draw intersecting lines. The sketch herewith shows a simple instrument for accomplishing the purpose that combines the precision of the latter method with the speed of the former.

All that is needed is a 45-deg. triangle of celluloid with a small hole near the center of the long side for the needle point, and with a series of short lines at suitable intervals located equidistantly on either side of the hole. The lines should be upon that side of the triangle that is next to the paper, while the figures may be on top.



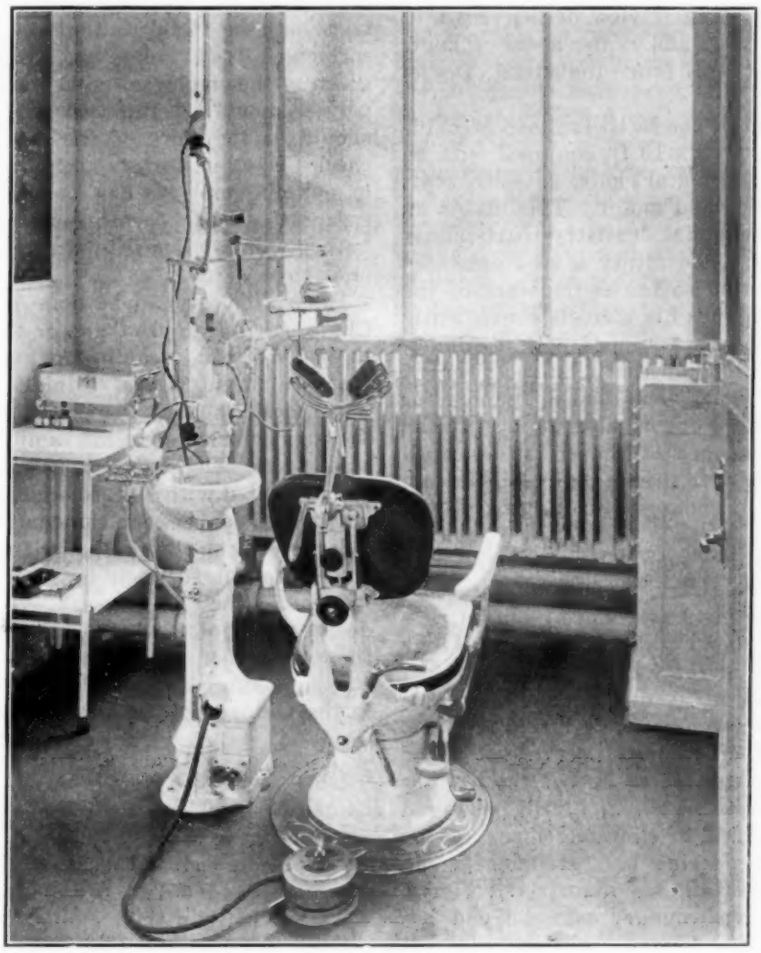
TOOL FOR LOCATING THE CENTER OF RADII

Industrial Dental Dispensaries

By SANFORD DeHART
Director of Hospital, R. K. LeBlond Machine Tool Co.

Does an Industrial Dental Dispensary pay?
What is the approximate cost of Dental Service?
Do the employees respond to the treatment?
Do the employees respond to the dentist's suggestions?
Do they resent it as being too paternalistic?
Are there any "don'ts" you might suggest?

THE questions in italics and various others are asked us by many manufacturers in different parts of the world. I say world, because we have received inquiries from as far off as Calcutta, India. London, England, has manifested an interest by requesting information in two different instances. Recently we received an inquiry from a representative of the government of New South Wales, Australia, requesting information relative to the success attending our work. This representative explained that it was a matter affecting the lives and futures of all the people of Australia, and he was anxious to procure facts, figures and personal opinions from the R. K. LeBlond Machine Tool Co., so that he might, as he expressed it, "convince the apathetic government dentists of New South Wales of the extreme urgency of Industrial Dentistry along proper lines." Recently I made a survey of plants employing dentists either part or full time, and I ascertained that the methods pursued were not to fill decayed teeth, not to straighten teeth nor treat "pyorrhea." I found that they cleaned the teeth, charted the mouths, noted decays and sent the patient to his family dentist. Some extracted teeth and some did not. Most of the dentists interviewed were in favor of extracting the teeth in their Industrial Dental Dispensary. In a few of the dental dispensaries the company carried the entire expense. Four of the industries furnished free dental service to the children of the employees. In some of the dispensaries the employees paid half, and in others the Mutual Aid of the plant paid the expense of the dispensary.



DENTAL DEPARTMENT OF THE LeBLOND CO.

Industrial Dentistry has received a great impetus since the war, owing to the fact that each of the 5,000,000 soldiers and sailors who went into training camps had his teeth examined, and where defects were found they were corrected. It was the work of the army dentist to keep the teeth of the recruits in first class shape, with the result that the teeth of the American soldier won the admiration of Europe. Many of these men who have returned to civilian life have learned the importance of taking care of their teeth and are serving as guides to other people who have not been taught the ill results of neglecting their teeth. Dr. Charles H. Mayo, the distinguished surgeon of Rochester, Minn., says—"the next greatest step in medical progress in preventive medicine should be made by the dentists." It is difficult to estimate the time lost from work due to defective teeth. All of the firms surveyed, which were operating dental clinics, advised me that the service pays for itself in the time saved in preventing toothache. One can very well appreciate the economic importance of an industrial dental clinic to an industry situated some distance from the center of things. It has been conservatively estimated that the savings to the LeBlond Co., on extractions alone, was approximately $2,200 in production, for the year 1919, based on the time a man would ordinarily lose if he were to visit his family dentist during working hours for the relief of toothache. It often happened that an employee reporting for work after a sleepless night, due to an ulcerated tooth, was willing to continue work after being relieved by our dentist. If we had not been situated so that we could promptly relieve these conditions we would have lost the services of these men for the entire day.

An idea of the work accomplished in the LeBlond dispensary can be illustrated by the following report:

Toothache	122	Examinations	121
Caries	104	Preventive	351
Treatments	386	Pyorrhea	39
Fillings (temporary)	64	X-ray	13
Extractions	306		

There were 1,506 mouths examined and charted during the year. Our records show that there were 96 per cent in need of dental services, only 4 per cent were found to have mouths that might be considered hygienic, 6 per cent were free from caries and responded to treatment readily, the remainder had disease-producing symptoms known to dentistry, such as abscesses, pulp stones, inflamed pulp, ill fitting crowns and ragged fillings causing irritation.

Normally, the LeBlond Co. has one thousand employees on its pay-roll. From the foregoing it may be gathered that the dental department has a good clientele.

Industrial dentistry is comparatively a new subject. In a list furnished me by the publishers of *Dental Register*, I find that there is but one Industrial Dental Clinic in Detroit. This is surprising in view of the fact that Detroit is a progressive city, and is the home of many large factories. There are four Industrial Dental Clinics in Cincinnati.

The Dental Department of the R. K. LeBlond Machine Tool Co., consists of a room 8 x 10 ft. equipped with an Industrial Unit, that is: a dental chair, gas, air, tray, light, drill, water, cuspidor and motor. This makes an ideal combination for industrial dentistry, particularly where the room is small. The utility is also enhanced since there is no lost motion so far as the work of the dentist is concerned, as he has his utensils conveniently near. The dental room is also equipped with a cabinet, file and a gas-oxygen outfit for the administration of anaesthetics. The usual small tools and appliances for extraction and preventive work is also a part of the equipment. A dental room such as I have just described could, with the present inflated prices, be installed, I am advised by dental supply houses, for approximately $1,800.

The personnel consists of a dentist, a graduate nurse who has specialized in dentistry, and an anaesthetist, who visits the plant when his services are required.

The dentist spends one hour a day at the plant, four days a week, and in view of the fact that his nurse has been trained to anticipate his wants, he is usually able to treat on an average of seven patients during his stay.

Our dentist has been practicing his profession for twenty-five years, and is considered one of the leading dentists in this city. Since he has naturally mastered his profession he is enabled to eliminate many of the non-essentials, thereby rendering him particularly efficient in expeditiously treating his industrial patients. It is hardly likely that a younger man or one not possessing these qualifications would be able to treat seven patients per hour and do justice to them.

This brings us to the point of the qualifications of an industrial dentist:

Qualifications

First—He should be a man of mature years, who has been practicing dentistry not less than ten years.

Second—He should know something about industry and the men he is to treat. He should be conservative in his statements as to the benefits derived in removing neuralgic and other obscure pains by the extraction of teeth. It may be well to note in this connection that the medical profession has of late been protesting against the reckless extraction of teeth. Dentists have obtained such beautiful results in some cases by extracting teeth, that some of them are now trying to explain most diseases on the basis of these focal infections. It has been the policy to pull the teeth first, and if the pain does not subside they look further to ascertain the cause of the pain. This phase of the work has met with many disappointments and has engendered a certain amount of distrust among the employees.

Third—He should have a pleasing personality and understand the social side of man. He should view dentistry from the employees' angle.

Scope of an Industrial Dental Department

Emergency work should be treated as conditions arise. Toothache should be relieved in all cases at once. Advisory work, consisting of thorough examination of the mouth and teeth and suggestions as to the proper work required should be done. Educational work, such as explaining to the patient all the details in connection with his case in terms that he can interpret should be included. Each mouth should be charted and a copy given to the employee. When defects are found the employee should be referred to his family dentist. It should be the work of the dentist or his assistant to check these cards every sixty days to ascertain whether or not the employee has had defects corrected. (With reference to the forms for a dental department, the author will be pleased to send blank forms to interested persons.)

Extractions should be done in the Industrial Dental Clinic, with the aid of gas or the different local anaesthetics. Teeth cleaning and polishing should be a feature of the Dental Clinic. Initial treatments for "pyorrhea" should be a part of the dentist's work, and the patient referred to his family dentist for subsequent treatments. Occasional talks on hygiene of the mouth supplemented with lantern slides will do much to cement good relations between the dentist and the patient.

In describing the foregoing functions of the dentist, I have been guided solely by what has been accomplished in the LeBlond Dispensary. To take care of all the dental needs of a plant employing 1,000 would require the services of several dentists giving all their time. Filling, making of teeth, crowns, etc., should not be done in the factory.

A Few Don'ts

Don't employ a young man to take charge of your dental work. There are too many complicated problems arising for a young man to solve in industrial work. Don't permit your dentist to attempt too much. I recall a case on whom a dentist was attempting some operative work in an industrial clinic, which terminated disastrously, and had it not been for the combined efforts of two physicians and the dentist the case might have been a fatality. Don't have your dentist visit the dispensary at irregular hours. Have a specified time for the dentist to report for work, so that the employees may know when to find him in his office. Much time is lost by the employees visiting the dental dispensary to inquire the dentist's hour. Don't employ a man who is not tactful.

As to the cost of operating an Industrial Dental Dispensary, I have conferred with a number of dentists engaged in this line of work and have read a vast amount of material on this subject. The consensus of opinion seems to be that good dentistry can be furnished industry for approximately $1.50 a year per employee.

The Law in Regard to Strikes—I

By CHESLA C. SHERLOCK

The ever-growing necessity for the enactment of laws, Federal and State, to govern or fix the responsibility for strikes and lockouts, which cause financial loss and inconvenience to the public, is one of the biggest problems in our present era of social and industrial development. What the law covers at this time is ably discussed in this first installment.

NO BETTER example of how public opinion forces the growth and development of law can be given than the case of strikes and lockouts. Just now we are in the midst of a great period of growth in the law in regard to this phase of human relationship, a growth that is at once tremendous and, at the same time, sane.

Jefferson, speaking just a hundred years ago, said: "I know that laws and institutions must go hand in hand with the progress of the human mind. As that becomes more developed, more enlightened, as new discoveries are made, new truths disclosed, and manners and opinions change with the change of circumstances, institutions must advance also and keep pace with the times. We might as well require a man to still wear the coat which fitted him when a boy, as civilized society to remain ever under the regimen of its barbarous ancestors. It is this preposterous idea which has lately deluged Europe in blood."

The "deluge" to which Jefferson referred was, of course, the French Revolution and the campaigns of Napoleon, but had the statement been made but yesterday it could not sound more up to date!

The development of the law in regard to strikes is of comparatively recent origin. In fact, most of it has taken place within the last half-century. And in the tracing of that development we have but to keep in mind the fact that law has ever followed public opinion to understand why some of its growth has been so one-sided, so imperfect, and, perhaps, so illogical.

In a previous discussion touching upon the subject of contracts with trades unions we brought out the fact that the courts have ever been reluctant to deal with individuals in the mass. The law is upheld for the protection of the individual and to clearly define his rights. The law has never willingly consented to merge individual rights into a mass and treat the mass with anything like the consideration shown the individual.

Business must, of necessity, often be conducted under a mass arrangement. So the Romans gave us the corporation, which by fiction of law is considered a legal entity or *person*. And, even then, we find the law in regard to corporations even more strict and specific than it is in the case of individuals, because the law has recognized from the beginning that an organization of people for a specific purpose presents a serious menace to the rights and privileges of individuals unless such organization is held in continuous check.

In trades unions, which are of very recent origin, the law is presented with a very different matter from that of corporations. The trades workmen represent a mass of individuals banded together for a specific purpose; namely, to further their own interests to the exclusion of the interests and rights of others. And, whether we care to look the facts in the face or not, the trades union is, under the normal expression and feeling of the law, dangerous to the rights of individuals.

Why? Largely because they represent an irresponsible mass which, at law, cannot be controlled in its obligations and covenants. Trades workmen, as everyone knows, will force a contract for wages from the employer either under the coercion of a strike or a threat or by actual violence. Then, next week, or next month, they may decide to have their wages advanced and there is no power which can compel them to work and render to society that service which they owe, until their demands have been satisfied. In fact, recent developments disclose that even the constituted authorities of the trades unions have no conclusive power over their mass, to look to the enforcement of agreements and covenants which the men have previously assented to.

The men may even assent to arbitration and an adjustment of their differences, but there is no power, as the law now stands, to compel them to abide by the decision rendered and carry out their portion of the agreement. Only public opinion today can, in any way, curb or control the action of the trades unions, and when we speak in this sense we refer to the right to keep the men at work.

The Rights of the Individuals

When you come to the right to work or to refrain from working you must lapse back to a consideration of the rights of individuals. Under our law men in the mass can be compelled to work against their will only when they have transgressed against the law and been convicted thereof, or when they have entered the military service. The individual, however, cannot be compelled to work. It is his right to refuse to work or to work as he wills it. In the making of an agreement through his trades union with an employer he avails himself of the advantage via the threat route of the mass, but when the performance of the agreement comes he avails himself of his individual right to quit work any time that pleases his whim or the whim of his fellows.

What else can be said of the relation? The courts have, through the force of expediency, declared that an agreement of workmen to strike cannot be considered a conspiracy. It is not in restraint of trade, for labor is not a commodity to be bought or sold. I think we all agree to the wisdom of the ruling that labor should not be treated as a commodity to be bought and sold, but let any other mass of individuals in the country seek mutual advantage through mass movement and they will promptly be haled into court for trespassing the rights of other individuals—with the exception of farmers banded together in co-operative enterprises, and here again we find the finger of political expediency.

This situation has come to us from the common law, due largely to the stress of the law at that time upon the rights of individuals and to the fact that in those days the courts were not called upon to treat of rights in any other form. Trades unions were unknown to the common law. Workmen were not organized. They dealt with their employers independently and as individuals. Hence, the solution of their problems did not serve to tangle the threads of individual rights. And in regard to employers who massed together in their enterprises, the law required them to incorporate and treated their corporation as a single person in the rights acquired, and held times without number that individuals massed together in a corporation could acquire no greater rights than an individual in the same calling, with certain enumerated exceptions.

Unions Should Be Controlled by Law

Trades unions are doubtless essential in our present-day commercial world. They serve a necessary purpose and they can serve a larger purpose in our industrial scheme of things, but, as in the case of the individual and of the corporation, their powers must be curbed and enumerated more specifically by the law, or the good which they can do will be obscured by the evil which they will accomplish. We must find some way to define more clearly the rights of all parties to the industrial tangle and to distinguish those rights clearly and without favor, if our "institutions are to advance also." We cannot ever bend under the "regimen of our barbarous ancestors" and escape paying the piper.

The solution will doubtless come when the courts and the legislative branches of our respective governments are content to consider and define the rights and liabilities of individuals in mass, and to abandon, so far as necessary, the old feeling that rights can be adjusted and considered only on the individual basis.

In fact, the solution will doubtless come in the acceptance of an early English decision, which has been lost sight of in the overwhelming maze of other decisions relating to strikes and labor troubles. In this decision, the court recognized the right of society at large to be considered in such disputes, and it had the courage to treat of the rights of respective parties in mass.

The coal strike a year ago crystallized public opinion more than anything else in this direction. It brought to the attention of the people for the first time what employers have known for a long time, namely, that there are more than two parties to a labor dispute, and the utter inadequacy of the law to meet such a situation and compel action. And this last summer we have witnessed another exhibition on the part of the trades union men where, in two separate unions, "illegal" walkouts were staged—walkouts not even sanctioned by the constituted leaders of the unions themselves.

Public opinion has in the past forced legislation and court decisions carefully and specifically setting out the rights, duties and liabilities of the employer. He is pretty well hedged in by legal restrictions as to what he may do and what he may not do. Properly so. But the weakness of the law as it stands today is not in its failure to curb the employer so much as in its failure to curb the employee and enumerate his rights, his duties and his liabilities. And, in considering this question which must necessarily involve a consideration of some means of controlling a mass, the rights, duties and liabilities of society must likewise be enumerated.

Society has the right to the uninterrupted enjoyment of the service of labor. But in asserting this right, the rights of labor need not be transgressed in the slightest degree. The courts have said from the beginning of time that society had a right to the peaceable adjustment of private disputes. And to guarantee that right the law has taken away the firearms of the individuals or the right to the uninterrupted use of them, and substituted arbitration through the courts of the differences between the parties.

A gun in the hands of an irresponsible party is a constant threat to society; the right to strike in the hands of an irresponsible mass is a constant threat to society. The taking away of the right to strike from trades unions can jeopardize their rights no more than the taking away of the right to use a gun anywhere and everywhere has jeopardized the rights of individuals. For honest rights once acquired, can never be taken away from individuals by the law, and never will be, unless other rights achieving the same end are substituted in their place.

The strike in the past has not been illegal; it is not illegal, in a general sense today. It is possible that it has been morally wrong to strike, but beyond that no one dares to go, and even moral rights are grounded in the expressions of organized public opinion, and nowhere else.

Just what might happen if union men were to strike in defiance of a law prohibiting strikes cannot, of course, be definitely stated, but a fair indication may be drawn from a case which recently occurred in the Federal District Court for the Southern District of Iowa.

The Des Moines Incident

The street railway men in the City of Des Moines have been engaged in a series of wage disputes and two strikes during the past year. A year ago they promulgated a strike for higher wages. The company has been in the hands of a receiver for the past two years.

The strike came at a very inopportune time so far as the city was concerned, being just before the Iowa State Fair when hundreds of thousands of visitors were expected in the city.

The strike at that time intimidated everyone. Judge Wade of the Federal Court, in order to get the men back to work, granted an increase of wages on the understanding that the city council was to submit a proposal to the voters to increase the fare which might be collected under the franchise. The men went back to work, but the people voted down the fare increase. The men, however, were paid the increase out of other funds on hand.

In the Spring, the men again demanded a further wage increase, doubtless moved by their successful experience the preceding fall. They demanded an increase averaging about 20 cents per hour above what the court had awarded them the year before. Arbitration was held and the men were granted an increase which the company, due to its insolvency, was unable to pay. The company did, however, continue to pay the old wage and to credit the men with the extra award, agreeing to pay it as soon as funds were available.

The men worked through the summer until state fair time again in August. In the meantime, the State Supreme Court had held that a franchise for a fixed fare for a fixed period of time was not valid and that the fare provision might be changed by the courts upon a showing of necessity. Judge Wade of the Federal Court promptly increased the city fare to 6 cents and ordered the receivers to pay the men the back pay out of the increased fare as rapidly as possible.

The men, however, demanded that the court order the receivers to advance them their back pay out of other funds on hand for taxes so that they might have the money in a lump sum. The court refused to do this, stating that it had no authority under the law to do so.

"But you did it last year!" argued the men.

"I did it because I thought the people would vote an increased fare to take care of the increased wage, but they didn't do it," answered Judge Wade. "I allowed expediency to govern me then, to cause me to do a thing I had no legal right to do, and I will not so act again."

The men then went out on a strike.

Judge Wade then issued an order to the receivers to close the car barns, cease operations, and further he cancelled the contract between the company and the men and declared that they had forfeited all wage rights under the contract and the arbitration awards and must be considered no longer as employees of the company.

It was not two hours until the union representatives were petitioning the court to rescind this order, on the understanding that the men would return to work under the preceding one.

Irresponsibility of Trades Unions

This case undoubtedly establishes a precedent in the country and it is fortunate that it occurred in a Federal Court, where the findings will have wide publicity. For it clearly brings out the utter irresponsibility of the average trades union in carrying out its obligations.

In this case a means was found to bring the men back to work peaceably, and in so doing the court also marked out a course along the definition of the rights of mass movements. No right of the men had been jeopardized, nothing taken away from them. They were merely trying to take advantage of a favorable situation and bring the court and the company to them on their knees as they had done the previous year.

Conclusion

There is no problem presented to employers and to the nation at large at the present moment that should call for the serious consideration and thought which the strike should call for. It is a matter which is going to be adjusted. We have expressed the weakness in the law, the people have sensed that weakness and public opinion is slowly moving, as it always does, toward a solution of that weakness and a better definition of all the rights of all the parties concerned in labor disputes.

In bringing out this weakness in the law as it stands today, it has forced us to necessarily exclude in this discussion many other points of vital interest, and probably more practical concern to employers, in regard to the strike and lockout. We shall discuss these matters in subsequent articles.

Slivers and Infections

By Alexander L. Prince
Medical Director, Industrial Department, Aetna Life Insurance Co.

In a recent issue of the *American Machinist* there appears, in the section devoted to "Ideas from practical men," an article by B. W. Franklin entitled "Sliver gouge made from part of broken light bulb."

In this article, Mr. Franklin describes how a "surgical tool" for removing slivers from the skin can be made from a discarded Mazda bulb, and shows by means of an illustration how this tool can be carried in a spectacle case.

The only inference which can be drawn from this article is that factory employes, machinists in particular, will find it practical and convenient to carry this instrument in the recesses of their spectacle cases and to use it for the purpose of digging out slivers from various parts of their anatomy.

If the removal of a sliver from the skin were a simple mechanical process free from all danger, Mr. Franklin's ingenuity would deserve commendation, but as the removal of a sliver is a surgical procedure requiring skill and training in order to prevent subsequent infection, the promiscuous use of Mr. Franklin's "surgical tool" cannot be too severely condemned.

A sliver wound, like all other wounds, is subject to invasion by "pus" germs and this means infection. To prevent infection is the function of the trained first aider, the nurse or the physician. These individuals are trained to take care of sliver wounds. They know that to use unsterilized instruments on human flesh is dangerous, therefore they use sterilized instruments and not germ laden "surgical tools" carried in a germ laden spectacle case. They also know about the after care of a sliver wound. They know how to keep the wound free from germs until healing has taken place. Furthermore, they do not believe in taking chances with "blood poisoning" as the man does who makes a practice of digging slivers out of his fingers.

To the man with a sliver in his hand—Play Safe. No matter how trivial your injury may seem, let a trained individual take care of it for you. A sliver properly removed and a sliver wound properly treated mean little or no inconvenience, but indiscriminate sliver digging will give "pus" germs an opportunity to thrive in your wound and the consequences may be so serious as to incapacitate you for weeks or months. Taboo the amateur "sliver digger" and avoid infection.

[While the industrial surgeon is to be commended for all work of this kind, we must remember that there are thousands of small shops where none can be maintained and where no hospital is available. In such cases the "shop surgeon" is bound to continue for some time to come. The great importance of cleanliness and the use of suitable antiseptic solution, both in connection with the wound and the instrument used, cannot be over emphasized.—Editor.]

The first openhearth reverberatory furnace in Manitoba recently commenced operations at Selkirk, about 10 miles northeast of Winnipeg. The plant, which represents an investment of about $1,000,000, is known as the Manitoba Rolling Mills, and its equipment is said to be of the most modern type, consisting principally of one 15-ton furnace, three 15-ton ladles, crane, dumps, molds and other machinery. All machinery is operated by electricity supplied by Winnipeg hydro-electric stations.

CONCRETE SHIPS

BY

Fred H. Colvin

EDITOR AMERICAN MACHINIST

The interesting mechanical features introduced in the building of concrete ships makes the subject of more than general interest even though the commercial future of such ships has not been assured and is subjected to much criticism.

THERE is much discussion, pro and con, as to the merits of the concrete ship. But whatever may be the ultimate outcome, the concrete ship is an experiment which interests the average mechanic in a number of ways. One of the largest concrete ships is shown in the accompanying illustrations, the "Selma" which is being finally fitted out in the drydock of the Alabama Drydock and Shipbuilding Co., of Mobile, Ala. The length of the ship is about 450 ft. and, as can be seen, is large enough to practically fill the dock, which is by no means small.

One of the things which impress the visitor to a concrete ship for the first time, is the trim, clean looking sides, the solid character of the guard rails, and the general appearance of neatness due to smoothly rounded corners give a much more pleasing impression than is generally expected. There is nothing of the concrete block appearance about it.

The mechanical equipment was installed while the ship was in the drydock where she was taken because it was considered necessary to introduce a large number of stirrups which are, in reality, large U-bolts or "hairpins" to tie the outer skin to the ribs on the inside. Channels were cut by air drills from the outside as in Fig. 8, so as to allow the U-bolt to lie in a recess below the surface of the concrete, these channels being filled with concrete after the stirrups are in place, in order to protect the iron from the corrosive action of the water.

The illustrations show a number of the most interesting features such as the plate let into the bow to protect the sides against the chafing of the anchor. The absence of a metal covering for the stem to protect it from being chafed by the cable when the anchor is down, has however been commented on.

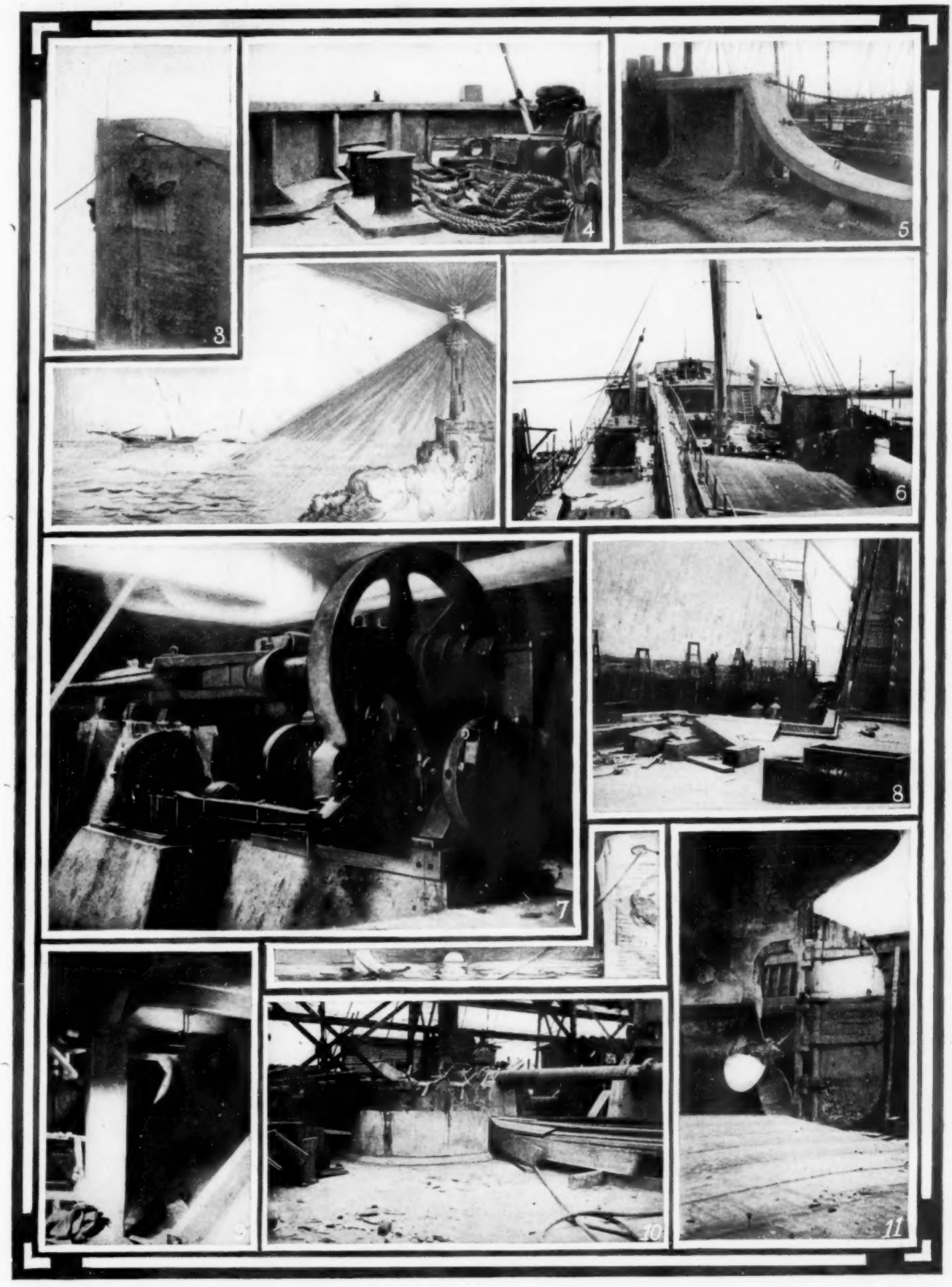
This, it is believed, is an error in judgment, and it is feared that with the anchor chains down, and swinging across the bow at times with the changing tide, that serious chafing and crumbling will take place. Whether this will occur remains of course to be seen, and unless the concrete ships are used more than they have been, this is not likely to cause serious difficulty.

Fig. 2 is a view toward the stern and shows the heavy oil piping, the runway at the right for maintaining communication between the bridge and the after deckhouse in bad weather or without climbing over the pipes, an open hatchway at the left, and the appearance of the ship generally.

The stern railing is shown in Fig. 4, the braces being cast solid with the rail and tying it firmly to the deck, which is also of concrete. The towing bitt is cast solidly into place in the deck. Another piece of railing, partly curved, is shown in Fig. 5. Fig. 6 is looking toward the bow and shows a continuation of the runway

FIG. 1. BETWEEN DOCK AND SHIP

FIG. 2. LOOKING TOWARD THE STERN



FIGS. 3 TO 11. THE CONCRETE SHIP IN DETAIL

Fig. 3—Anchor and protecting plate. Fig. 4—Stern railing. Fig. 5—Part of railing. Fig. 6—Looking toward the bow. Fig. 7—Steering engine housing. Fig. 8—Strengthening the sides. Fig.9—Concrete deck supports. Fig. 10—Concrete housing and pipe supports. Fig. 11—How the stern frame is held.

which connects the bridges. This part of the deck is comparatively clear.

Perhaps one of the greatest advantages in this form of construction is seen in Fig. 7, where the steering engine is mounted on concrete foundations which are a part of the ship itself. These are cast in forms of suitable shape and it is difficult to imagine more satisfactory mounting for machinery on shipboard.

Another view in this same locality is that in Fig. 9, which shows a column, cast of concrete, which ties the decks together. This is right beside the steering engine and the inclined wall at the right is the outer skin of stern of the vessel, with its strengthening ribs.

A concrete housing over the tanks and cast concrete pipe supports are shown in Fig. 10. Fig. 11 shows the rudder with its frame which contains the outboard bearing for the propeller shaft. This shows the way in which the frame is cast into the concrete so as to form an integral part of it.

The ease with which any desired form of railing or support for machinery or for piping can be secured is shown in Figs. 4, 5, 7, 8, 9 and 10. This is readily accomplished by pouring or casting the concrete in suitable forms. The general appearance of the ship can be seen from the two views in the headpiece as well as from some of the details.

Setting Diamonds for Truing Grinding Wheels

By E. E. Henry

I have given the mounting of diamonds for wheel dressing a great deal of study in actual practice, besides searching standard works and writing to many concerns who are large users of diamonds. After trying each method that seemed good, I have found the method here shown to be the quickest, simplest and most substantial way of all.

I use ½-in. cold rolled steel for a holder 2¼-in. long and drill a hole lengthwise entirely from end to end but only let the drill point barely come through the farther end just enough to leave a very small hole. This leaves a shoulder against which the diamond may set. The size of the hole, of course, depends upon the size of each diamond, but this hole should be slightly larger than the diamond so as to allow the latter to turn over or around and to allow one to get the desired point forward that is to protrude from the end of holder.

The back end of the holder is threaded for a headless setscrew not under ⅜ in. in size and the thread must run deep enough to let the setscrew fully inside of the holder. Care should be taken to grind the drill so as to form the shoulder as near to the shape of the point of the diamond as can be done, so as to give as much support as possible to it.

After drilling and tapping the holder as shown in the sketch drop the diamond into it with the point ahead that is chosen for the cutting point. If the diamond does not come right to stick out of the end as desired, push it in from behind with a square-ended rod or punch and with a scriber or sharp ended file, one can reach in through the small hole and work the point to any desired position; then when it does come right, hold it by lowering the front end of the holder to a vertical position.

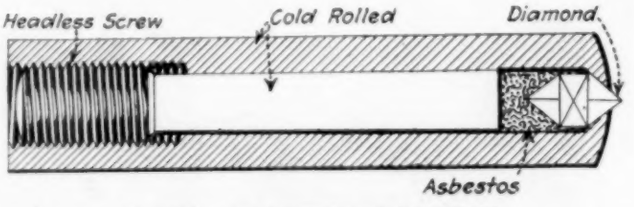
Now take a sheet of asbestos, roll it up in a wad or ball, and drop it in on top of the diamond. This acts as a cushion and fills in all around the diamond and forms a perfect seat in which the diamond becomes solidly imbedded when pressure is applied. Cut a piece of cold rolled steel or brass rod that will fit loosely into the holder and long enough to occupy the space between the asbestos and the setscrew.

Easy to Reset

As the diamond point wears off and the end of the holder also wears back, this same holder can be made just as good by backing the diamond out, upsetting the front end and turning the diamond around for another cutting edge. The diamonds can always be made tight by setting up on setscrew. The grade of diamond to use depends entirely upon the size, thickness and grade of the wheel, but this method of setting has proven good in all cases. Its advantages are many and we get much longer life out of the diamond. The best feature, however, is that they are so easily reset.

Our grinder foreman closely watches each diamond and when one becomes flat it is only a matter of five minutes to turn it over to a new cutting edge or put it into a new holder; also, should one become loose or show a flaw, it is only a matter of a few minutes to reset or tighten it.

I have tried most of the methods described in books and have also tried a couple of methods described in



METHOD OF SETTING A DIAMOND

American Machinist. One was a method of mounting the diamond in a holder and welding it in with cast iron. This method holds all right but is a great deal of trouble to set, and then there is the same trouble over again as the diamond wears flat and it must be cut out and reset.

When diamonds are too small to be set this way, they are then brazed in, in the usual manner. Our diamonds run in size from 1 to 3½ carat but when below 1 carat we braze them and use them on small wheels.

Diamonds Need Attention

All users of diamond dressers know that a sharp diamond dresses nicely and gives good results, while a diamond that has worn flat will not give good results but heats while dressing, seems to glaze the wheel, and will not give an even finish. It is also likely to cause chatter.

My experience has taught me to set diamonds so they are easily changed, look them over every day, do not allow them to get very flat and keep them tight and turn them over often to keep a sharp point. Use a great deal of water while truing up the wheel and take light cuts. Mark each diamond so that one can tell which it is and if it looks doubtful or is small, favor it on light work and use the large solid ones on the heavy work.

It is to be noticed that some grinder-men will get several times the wear out of a diamond that their partners can on the same wheel, which goes to show that common sense and good judgment are factors in their use.

An Appeal on Behalf of the Nolan Patent Office Bill H. R. 11,984

THE purpose of the Nolan Patent Office Bill H.R. 11,984, is to increase the examining and clerical forces of the patent office and to raise their salaries so as to give that office a sufficient force and at salaries that will attract and hold competent men to enable it to make its examinations with that reasonable promptness which is necessary to make it worth while applying for them, and with such thoroughness as to reduce the percentage of errors to as low a limit as sufficient time for the work and proper qualifications can possibly effect.

Engineering Council appointed its patents committee for the purpose of aiding the Nolan bill and urged the membership of the constituent societies to communicate with the patent committees of the House of Representatives and the Senate and with the Representatives and Senators from the districts and states of the respective members on behalf of the said bill. The influence thus exerted and that of other organizations was so powerful that at a hearing before the rules committee of the House of Representatives, which was largely attended by officers of members of Engineering Council and of the said societies and organizations, the Nolan bill was ordered made special and the House of Representatives promptly passed it without amendment by a very large majority.

A similar hearing on the bill was held by the patent committee of the Senate, but, in order to remove objection to unanimous consent to a special hearing by the Senate, before adjournment of the session, the patent committee of the Senate consented to amendments so seriously reducing the force and salaries of the bill as passed by the House of Representatives as to reduce the examining and clerical forces below the numbers now actually employed in the patent office. The increases of the salaries provided in the bill were also cut down to where they are seriously inadequate to attract or hold a sufficient number of qualified men to enable the patent office to do its work. The steady exodus of examiners from the patent office, which has been going on for some time, has not been stayed at all by the passage of the bill by the Senate.

The bill was referred by the Senate to a conference committee, of which the Senate members are:

Senator George W. Norris, of Nebraska; Senator George B. Brandegee, of Connecticut, and Senator William F. Kirby, of Arkansas.

The members of the conference committee for the House of Representatives have not been appointed, but Hon. John I. Nolan, of California, is certain to be one.

Engineering Council regarding the matter as of grave importance unanimously passed the following resolutions on October 21, 1920:

Resolutions of Engineering Council Concerning the Nolan Patent Office Bill H. R. 11,984

"Whereas, the United States Patent Office is vitally important to our industries, to induce the production of scientific and technical improvements and to enable our industries to keep abreast of those of other countries and,

"Whereas, the volume of work of the patent office for many years has increased much more rapidly than its examining and clerical forces have been increased, and the work in the past fiscal year has increased 36 per cent above the work of the previous year; and,

"Whereas, the salaries of examiners, except for a war bonus, have only been increased 10 per cent in seventy years and are so low that resignations of examiners are constantly occurring in a steady stream, averaging 25 per cent per annum, and resulting in such frequent changes that much inefficiency unavoidably results therefrom, even where examiners are qualified for the work, and many men are necessarily employed as examiners who cannot pass the examination required to qualify for their positions; and the salaries of the clerical forces are considerably below the average of salaries for corresponding work in the governmental departments generally; and,

"Whereas, as a result of such situation, the patent office is at such a great disadvantage that it unavoidably grants an undue proportion of defective patents, resulting in heavy losses both to the inventors and the public, due to useless development and unnecessary litigation, and the patent office is so far behind in its work that the value of many transactions with it is greatly reduced and in some instances destroyed by the delay; and,

"Whereas, as a partial remedy for such situation Nolan Bill H. R. 11,984 was introduced into Congress providing for an increase in the examining corps of the patent office of but 5.8 per cent and an increase in the clerical force of but 3.9 per cent, and providing increases in the salary for the position of primary examiners from $2,700 to $3,900 and of assistant examiners in proportion, and providing increases in the salaries of the clerical force only to bring them up approximately to the average corresponding salaries of other governmental departments and bureaus, and as the cost of the increased salaries and force of the said Nolan bill was more than met by an increase in the fees for patents provided therein; and,

"Whereas, the United States Senate so amended the said Nolan bill that instead of increasing it decreases the examining corps by 15.7 per cent and reduces the clerical force by about 1 per cent below the present insufficient numbers of said examining corps and clerical force actually employed in the patent office, as well as reduces the salaries, both of the examining and the clerical forces, so that the total present pay roll is reduced 5.9 per cent, notwithstanding that the increase in the fees for patents which were made to provide funds for the increased force and salaries were retained in the bill; and,

"Whereas, in the opinion of Engineering Council, the general effect of the changes in force and salaries made by the Senate would amount to a catastrophe for the patent office; and,

"Whereas, the salary of $3,900, provided in the bill as it passed the House of Representatives, is low for the position of principal examiner when compared with the salaries paid by private corporations and employers for engineers having a similar grade of responsi-

bilities and requirements—that is, engineers required to make and assume responsibility for final decisions in important matters and to have highly technical knowledge—especially as such examiners must have both legal and technical knowledge and notwithstanding allowance for the fact that governmental salaries are not as high as those paid by private interests; and the salaries for other grades of examiners are low in proportion;

"Now, therefore, be it resolved, that Engineering Council, representing 45,000 engineers, regards it of large importance that the numbers of the examining and clerical forces for the patent office and the salaries therefor in Nolan Patent Bill H. R. 11,984 be restored to those in the bill as it passed the House of Representatives; that the bill be freed from any riders, such as section 9 thereof, which may delay or jeopardize the passage thereof, and that the bill be made a law at the earliest possible moment."

"Engineering Council, having on the 21st day of October, 1920, passed a resolution urging the restoration to their original values of the figures for the examining and clerical forces of the patent office and the salaries therefor in the Nolan Patent Office Bill H. R. 11,984, recommends that the constituent engineering societies which it represents request their memberships to communicate with their Representatives and Senators in Congress, urging action in accordance with the said resolutions."

As the patent office is steadily losing more and more of its competent men and is rapidly getting farther and farther behind in its work, and as to get much farther behind would mean for it practically to cease to function, and as the bill, as amended by the Senate, is wholly inadequate to accomplish its purpose, and would be worse than useless, every effort should be made to induce Congress to restore the figures of the bill to their values as passed by the House of Representatives.

The conference committee will probably take the bill up for consideration the middle or latter part of December. Each member of the society is therefore most earnestly requested to write or telegraph to the member of Congress from his district, to the Senators from his state and to the members of the conference committee, urging that the figures of the Nolan Patent Office Bill H. R. 11,984 be restored to the values which passed the House of Representatives.

It would also be well to urge that the bill be freed from any riders not related thereto, so that its early enactment will not be hindered by opposition to such riders.

The names of the Senators and Representatives can be obtained from the World Almanac or similar publications and from postmasters.

Increasing the Capacity of Old Locomotives*

By C. B. SMITH

Mechanical Engineer, Boston and Maine Railroad

The usual policy of the railroads with reference to the purchase of new locomotives and the conversion of old ones is not, in the opinion of the writer, as well provided for as the demands of the service require. The difficulty lies in the fact that shop facilities are inadequate, a large amount of both time and money being unnecessarily consumed in order to keep locomotives in service. The problems of adapting the old-type locomotives to suburban and local service are discussed and the items which are to be considered in any program for increasing locomotive capacity are listed.

IN THESE days of the high cost of railroading, responsible officers of the mechanical departments realize that the necessity for reducing the cost of all locomotive operation and maintenance is more urgent than ever. Such saving can be acomplished in two ways, one by using new and modern locomotives, the other by rebuilding old types.

The purchase of new locomotives is usually confined to the largest units permissible for each type required, and they are equipped with superheaters and other modern devices as selected by the purchaser. Older engines of modern type, but not originally supplied with superheaters, are also being so equipped at general shoppings of these engines on the greater number of the roads of the country, and as rapidly as local conditions will permit. This improvement brings the older locomotives up to the capacity of those more recently purchased, and such reconstruction will undoubtedly be continued until all such locomotives have been modernized. The wisdom of this work is known to all.

On the majority of our roads there are still locomotives of the earlier modern types whose general features of construction are satisfactory, and which only require modernizing to make them economical transportation units. Improvements for such classes of locomotives may include, in addition to superheaters, piston valves in place of slide valves, outside valve gears in place of Stephenson motion, and such other improvements as are usually made upon engines at general shoppings.

Items in Locomotive Repair Program

Items which are to be considered in any program for increasing locomotive capacity are: (1) Superheater; (2) pyrometers; (3) brick arch; (4) valve motion; (5) mechanical stoker; (6) power reverse gear; (7) automatic fire door; (8) feedwater heater; (9) improvements in boiler design when new boilers are required; (10) improved boiler circulation; (11) increasing firebox heating surface; (12) flexible staybolts—breakage zones; (13) covering steam pipes; (14) flange oilers; (15) automatic driving-box wedges on heavy locomotives; (16) steam-pipe joints at smokebox; (17) pneumatic bellringer, and (18) chime whistle on freight—more audible to train crew. These items are numbered for convenient reference and do not necessarily indicate the order of importance.

*Paper presented at the Annual Meeting, New York, December, 1920, of The American Society of Mechanical Engineers, 29 West 39th St., New York.

Factors which will increase the capacity of a locomotive may do so directly or indirectly, singly or in connection with others. When setting out to rebuild a locomotive the experienced supervisor appreciates the opportunity to apply many devices and facilities which will standardize the engine in accordance with the railroad company's practice, and in so doing, reduce repairs and stores department expense in maintenance.

The aggregate of such improvement results in a locomotive which in proportion to its capacity will produce service results comparable with those of entirely modern construction, and at a cost approximately one-half that for a new locomotive of similar capacity. The difficulty in carrying forward an extensive reconstruction program, however, is in finding the shop facilities either on the railroad or among the locomotive builders in order to advance the work at a satisfactory rate of progress. Nevertheless, despite this difficulty the results which could be obtained from the operation of reconstructed locomotives, if they could all be rebuilt within the next few years, would justify a special effort on the part of railroad managements to bring it about.

On roads where the number of old locomotives which warrant rebuilding is sufficient to require a period of more than three years to complete the work, it would seem necessary to arrange for enlargement of shop facilities in order to hasten the reconstruction. If, however, adequate shopping facilities are not forthcoming, the improvement program for locomotives must be confined chiefly to the application of superheaters and the substitution of piston for slide valves, together with the minor but relatively important betterments that may usually be applied at the shopping period. On some roads this work alone will require six years at the present rate to equip what can rightly be called the "early-modern" locomotives.

Some of the engines built within the past ten years have developed weaknesses in frames and in parts of running gear. It has proved justifiable to reconstruct them by substituting new parts of stronger design and thus avoid recurring breakages which interrupt both the road service of these engines and the repairs to others.

Old locomotives requiring new boilers have very generally been scrapped, but where light train service demands no heavier engines than formerly, the writer believes it advisable to rebuild such engines with radial-stay boilers, superheaters, new piston-valve cylinders, main frames when necessary, and outside valve gears. If there is to be no increase in the boiler pressure over that formerly carried by the locomotive and the valve motion has given little trouble by breakages, the Stephenson motion may be connected to the piston valves through the usual rocker-shaft connections.

Old locomotives that are unsatisfactory as to wheel arrangement may be rebuilt and changed to another type and service. One road has converted 2-8-0 type or Consolidation locomotives to 0-8-0 switching service by removing the leading truck, applying a new boiler, new cylinders, outside valve gear, power reverse gear, and modifying the frames as required. The boiler was located properly to balance the engine. The use of the running gear and many of the parts of the original locomotive doubtless justifies such extensive reconstruction work where additional switching locomotives are needed.

The old eight-wheeled, American-type locomotives having crown-bar boilers with deep fireboxes between frames have become obsolete on many large roads, but on the small roads and on branch-line and local train service in much of the New England territory these engines, modernized as far as consistent, should be carefully considered where the traffic conditions warrant.

Because of limiting weight conditions, Mogul or 2-6-0 type locomotives have been assigned to passenger-train service on some outlying divisions. The application of superheater and piston-valve steam chests with outside steam-pipe connections as the principal features of improvement, has increased the economy of these engines, added one passenger car to their tonnage capacity, and reduced train delays. Outside valve gears were not applied, shop limitations preventing, but their addition is desirable.

Atlantic-type locomotives having outside valve gears have had their capacity and economy increased by the application of the superheater. This work permitted the use of the engine in long-distance through service which was not previously successful.

Consolidation locomotives reconstructed with superheaters, new piston-valve cylinders, outside valve gears, new front-frame sections, and frame cross-ties have also had their capacity increased, and have been successfully used in regular freight service on a mountain division greatly needing such power. The cost of the above-mentioned improvements, including heavy general repairs and entirely new fireboxes, would not exceed one-half the cost of new locomotives of the same capacity.

When rebuilding locomotives there is a favorable opportunity for replacing old tenders as well, transferring the latter to older locomotives for spare use or as substitutes for damaged equipment. When the condition of old steel tender frames requires that they be replaced, the one-piece steel casting and a larger-capacity tank should be used, as both will reduce future expense in repairs. The success of autogenous welding eliminates any objections to the use of large steel castings for fear of breakages.

Tanks should be reconstructed in coal space to permit gravity delivery of the greatest amount of fuel that is possible at the coal gates within reach of the fireman's shovel. Application of power-operated coal pushers should be made to tanks where alterations for the gravity delivery of coal cannot be satisfactorily made and where the service conditions will show a saving in expense by its use over hand methods of shoveling forward coal while on the road or at short lay-over stations. Moving forward the rear coal board or plate on tanks and building higher side plates or "dickies" is one method which has been successful in making the maximum amount of coal accessible at the gates. Furthermore, care must be taken not to overload the journals of the forward truck axles.

Some Mechanics of Hand Made Tires

SPECIAL CORRESPONDENCE

Way down in the southwestern corner of the United States, in San Diego, Cal., to be more exact, is the Spreckels "Savage" Tire Co., which specializes in hand made tires, but utilizes all the mechanical devices possible for aiding the hand worker. The stands for holding the tire while the treads are being put in place are shown in Fig. 1. Each stand carries a spider which holds the tire core, allowing the wheel to be revolved or to be turned to any position. The tread of the tires is not molded in the usual sense, although when anti-skid devices are desired the tread

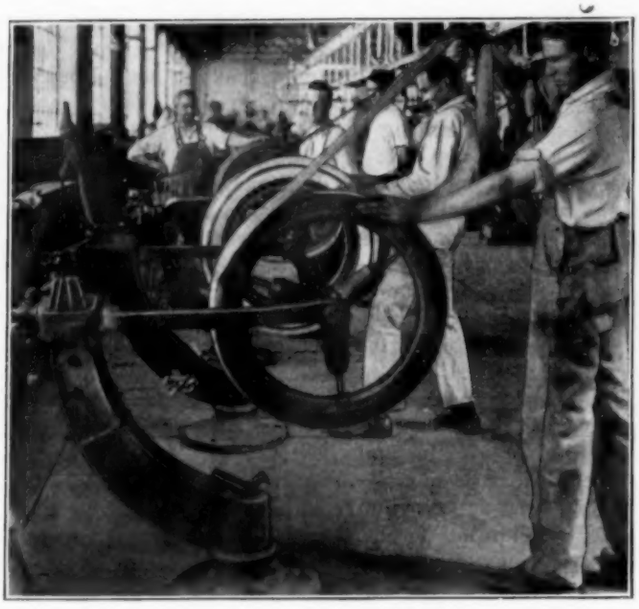


FIG. 1. STANDS FOR PUTTING ON TREAD

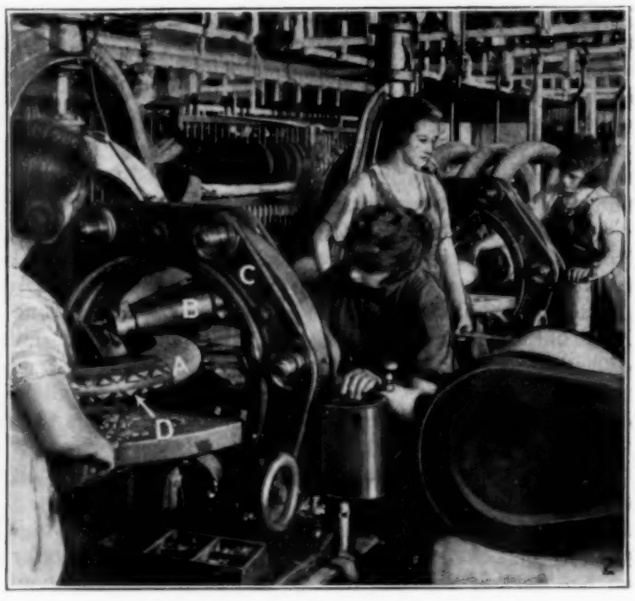


FIG. 2. WRAPPING THE NON-SKID TREAD

strip has the design molded in it in a long press before the strip is applied to the tire itself.

Fig. 2 shows the way in which the anti-skid depressions are maintained during the curing pressure under heat. This type is what is known as a wrapped-tread tire, the machine in Fig. 2 showing how the wrapping is accomplished. The tire *A* is swung into position on a revolving table, and conical rollers *B* hold it firmly in place while the table is revolving. The wrapping tape or cloth is carried on spools in the frame *C*, which surrounds the tire, the spools carrying the tape around the tread as shown.

In order to preserve the indentations aluminum blocks are fitted into the depressions as shown at *D*, the wrapping tape holding them firmly in place during the curing of the shoe. After the tire has been properly treated the wrapping is removed and the aluminum blocks are taken out of the depressions.

Device for Grinding Engraving Tools

By J. V. Hunter

The degree of successful service obtained from an engraving machine depends very largely upon the grinding of its tools. In the shop of the S. A. Rhodes Manufacturing Co., Chicago, a Gorton engraving machine is used for graduating dials and other delicate and extremely accurate work on optical instruments. The tools for this engraving work are ground on a special device, Fig. 1, which was designed by Mr. Rhodes.

A cast-iron base supports a small motor, carrying the grinding wheel, and a bracket, upon which a compound toolslide is mounted.

An essential requirement of the engraving tool is that its point shall lie in its axis of rotation. For grinding it is mounted in an arbor or sleeve, Fig. 2. The outside surface of the sleeve is ground concentric with its bore. A knurled end is provided for a finger hold while grinding. The illustration shows a tool in its sleeve, lying in a gage. This device has a finished V-groove in which the sleeve lies, and along which the needle point, which does the gaging, is adjustable. The base of the groove is slotted and a spring friction block is provided to hold the needle block firmly in the groove. It will be noted that the point of the tool shown was ground true with the center axis of the shank. Rotation of the sleeve and tool shows whether or not the point is central in all positions of the tool.

For grinding the tool sleeve is laid in the V-grooves of the bracket of the grinding device. The three slides make it possible to set the tool at the proper angle with the grinding wheel, feed it in and out and adjust it vertically. In starting to grind the cutting edge of the tool is turned slightly above the line of contact on the wheel and a clearance angle is ground back of the cutting edge of the tool in the same manner that clearance is provided on a drill. After grinding the edge is carefully stoned by hand and again gaged.

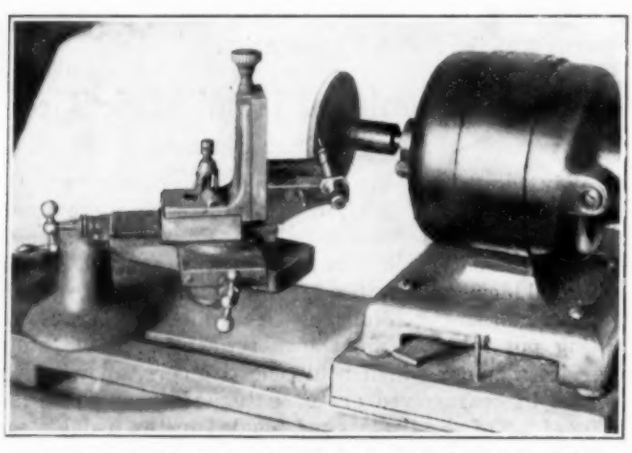


FIG. 1. DEVICE FOR GRINDING ENGRAVING TOOLS

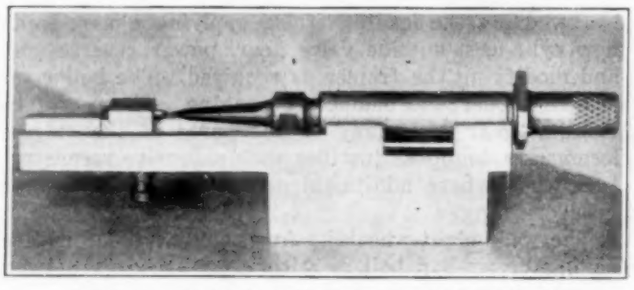


FIG. 2. GAGING ENGRAVING TOOL POINT

Assembling Cleveland Parts

BY FRED H. COLVIN
Editor, *American Machinist*

Assembling the different units in motor vehicles involves many problems not usually found elsewhere. Many of the solutions, however, are applicable to some extent in other lines of work. Modifications of progressive assembly methods are making their way into small shops on large production work.

ALTHOUGH the Cleveland Automobile Co. makes comparatively few of its units at the present time, the rear-axle assembly is largely put together in its own erecting shop. One of the first operations is that of forcing on the housing which supports the band brakes at the rear wheels as is shown in Fig. 1. This operation is done on a Metalwood press which has been devised particularly for this kind of work and carries its own pumps for securing the necessary pressure. The pressed steel axle-housing is laid over the stop *A*, which locates it and also holds it against the thrust of the forcing-on process. The malleable casting *B*, which supports the brake bands and also carries the rear spring seat, is about to be forced into position on the turned end of the axle housing. A pile of these housings are shown behind the press, while a few of those which have had the end castings forced into place are shown at *C*.

A Double-Deck Track

The method of assembling the complete rear-axle unit is shown in Fig. 2. Small four-wheeled trucks *A* are provided to run on the raised track *B*. The trucks are substantially made and carry V-shaped blocks *C*. This is a case of progressive assembling, the units being completed at the end of the line and, after the axles have been removed, the trucks are returned on the lower rails as at *D*. This form of double-deck track is one that can be applied elsewhere.

The completed rear axles go to the testing stand shown in Fig. 3, where they are run by the motor *A* while the load is supplied by the brake *B*. By this method full load can be applied, so that noises or interferences of any kind may be readily discovered.

Running in Motors

Although the engines are not built in this factory, they are run in and tested before being assembled in the chassis. The method of running in is shown in Fig. 4. The arrangement consists primarily of sub-

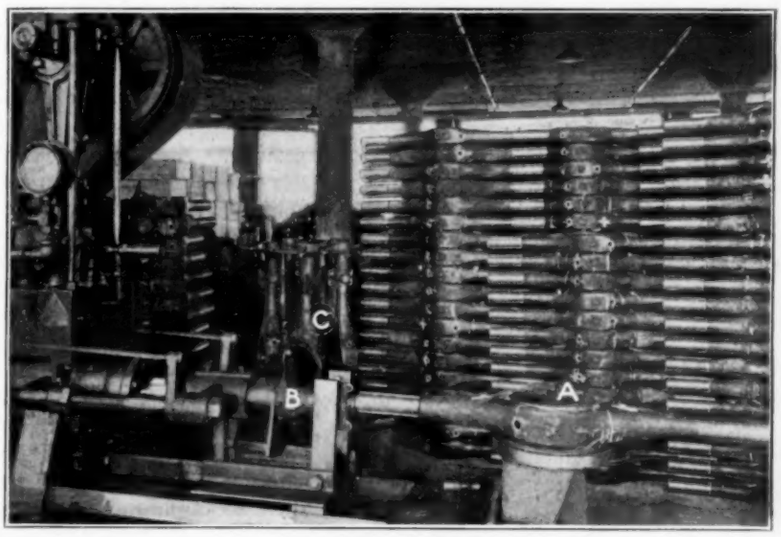


FIG. 1. PRESSING ON BRAKE HOUSINGS

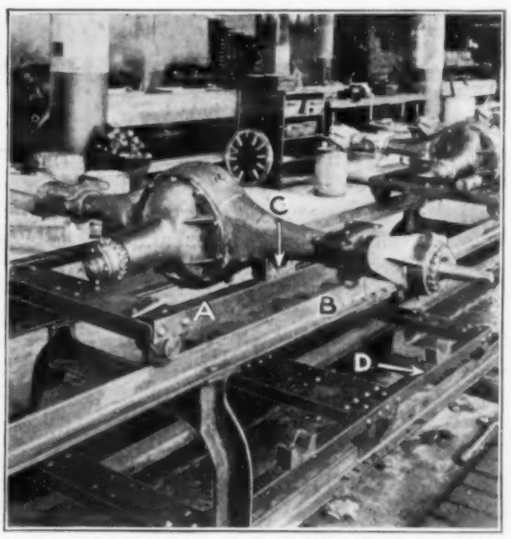


FIG. 2. ASSEMBLING FIXTURE AND TRACK

AUTOMOTIVE CONSTRUCTION

stantial tanks which contain pedestals on which the engine rests in an inverted position, as can be seen from the one that is being lowered into the first tank. After being fastened in position, it is connected to the electric motor shown and the cover closed. The motor runs on a 500-volt circuit and usually requires from 100 to 120 amp. at the start. As soon as the bearings limber up so that the amperage drops to 50 the cover is raised and the oil pipe is swung into the tank. The oil is then turned on to the bearings and the engines run from 5 to 10 min. This is a combination of running in the bearings dry and also with lubrication. The installation is very neatly arranged, the air hoist making it easy to handle the engines and at the same time the tank and covers keep the place comparatively free from splashing oil.

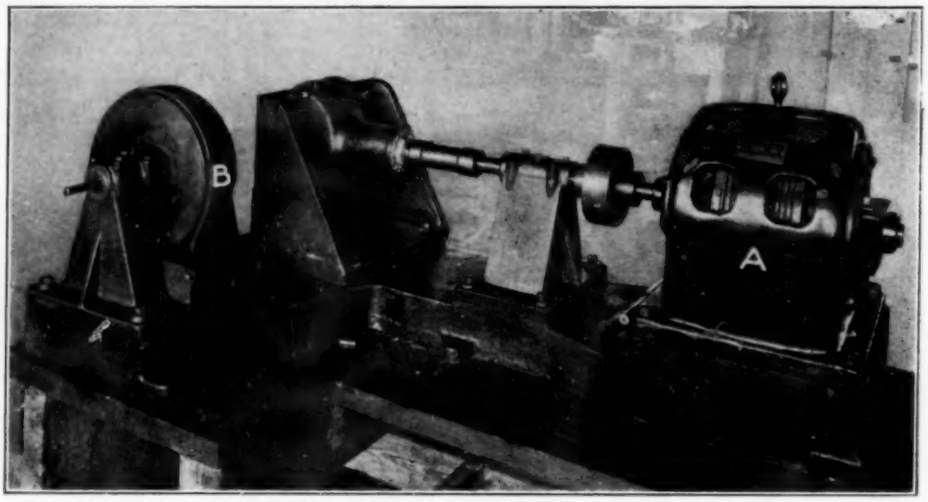


FIG. 3. TESTING THE REAR AXLE

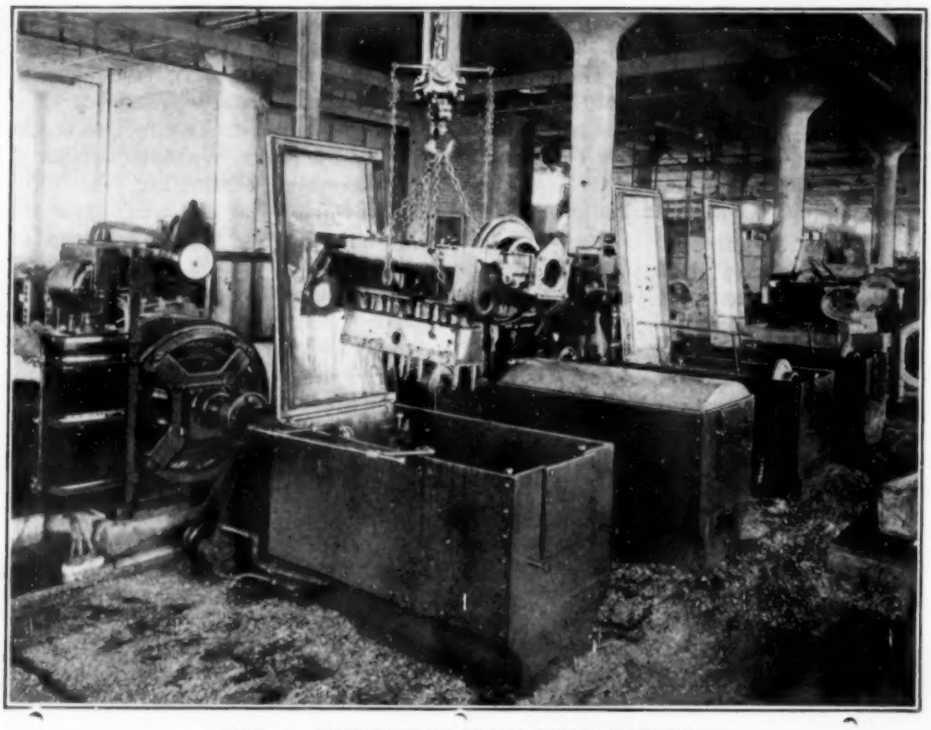


FIG. 4. RUNNING-IN STANDS FOR MOTORS

Industrial Housing—Whose Job?

BY ENTROPY

During the war it seemed to be assumed quite generally that if a shop was having trouble keeping a sufficient body of workers it was up to the shop to provide housing. Previous to that it was pretty safe to assume that wherever there was a body of workmen real estate men would follow pretty closely. Of course these people furnished housing for the profit to themselves and not at all because the shops needed it. Nor did they concern themselves overmuch about the beauty of the houses they built, though the last few years before the war saw a great improvement in this direction. The profit in real estate, as real estate, must be very large to make the business as a whole profitable. After it is ascertained that there is to be a good number of people who could profitably occupy houses in a new district the land must be bought cheap, dirt cheap so to speak. It must be bought as farm land by the acre even though it is to be sold by the foot. Then there is the chance of taking a quick profit by selling house lots. A steam shovel is run through the street locations, and the knolls put in the hollows and street signs put up at the intersections. An elaborate entrance with stone lamp posts is put up and away go the lots, all on the installment plan. The small payment down that is required is sufficient to cover the total cost to the promoter. The additional payments made and the re-sale of the numerous lots on which payments are defaulted constitute a nice little profit.

The next stage is to build houses. Of course if the location is excellent and money is easy to get it may not be necessary to do that but it is a source of profit under normal conditions. A house built to sell is not of much use for any other purpose unless the building laws are rigid and well enforced, in which case the promoters are not so apt to start a campaign. Estimates for building costs are very likely to be made on the basis of cost per cubic foot. The purchaser of a house 30 feet

square and two stories high expects naturally that it costs about the same for one house of that size as another. He is mistaken and that is where the builder of houses for sale makes his money. He depends on the purchaser, and also the banks, valuing his houses by the cubic content. There is a very great difference. It was possible before the war to build a house that would stand up and carry a coat of attractive paint for half what ought to have been put into it and for a third of what it was profitable to put in. Cellar walls of field stone laid loosely and pointed on the inside with lime mortar, frame under-weight and wide spaced, no bracing, small stock windows, stock finish of poorest quality lumber that will run through a finish mill, second-grade glass full of streaks and bubbles, plumbing that looks the part and stops there, inadequate furnaces in a climate that calls for steam or hot water, pressed steel hardware brass-plated, electric light fixtures ditto. All the way through from cellar to roof and perhaps a little more on both cellar and roof the "Jerry" builder cuts costs. When he gets through and the second coat of paint is on the thing looks just like a regular house and the savings bank, or at any rate the co-operative bank, loans all that the land and building cost. The profit came, as it did with the land, in such future payments as were made and in the resale of the property that was released by people who could not or would not pay the installments. The purchaser spends at least twice as much for coal as he should and is never comfortable. He pays taxes on more than the house cost to build and he begins to repair long before he should.

The advantage is this, houses are built and the workmen in nearby shops get a place to live. Without the profiteering builder he does not unless the firm builds for him. But the firm cannot build that way. The firm is in the limelight and everybody keeps close tabs. In fact about the first thing that a company does before starting to build is to advertise that it is going to use only the best of materials and that the houses are to be sold at cost. They are usually sold, if at all, below cost. But they are usually pretty good houses with only one defect common to them all and that is that they are built for a race of pygmies with small families. That is, the only legitimate way to get a low cost house that is well built is to make it small.

On the other hand it should be said that the real estate man's way has been productive of good results no matter how unethical it may seem. These houses do not fall down. The cost a great deal for repairs but in the course of time are repaired until they are something like the boy's jack knife with six new blades and three new handles but the same jack knife still. The total cost is more than it would have been to build a good house to begin with but the people who bought could not have bought a good house at all, so there is a distinct gain, because the cost has been distributed over a longer period of time. It really seems better for a family to have a large enough home so that they have a little elbow room than to build a tiny house of better quality.

The real question is, cannot our engineers tell us where we can cut the cost of a long-lived house without cutting its size? Simplicity of design has a great deal more to do with cost than most builders imagine. A few large rooms cost less than many small ones. Plaster and paper cost money and a large number of partitions adds to the area to be covered. Plumbing can be concentrated so that one stack takes care of it. If the walls, roof and windows are tight a small steam heater will do the work and assure comfort where a large furnace would be inadequate. If coupled to this the lines of the house are good, that is if it is in good proportion and graceful, no ornamentation is necessary. It costs no more to build a house that looks right than it does to make the plainest sort of box. It costs much less than it does to put gingerbread ornamentation all over it.

What hinders our getting houses? Nothing but lack of money with which to build. That everything is high goes without saying. Builders and lenders of money for building seem to expect lower prices but it does not seem likely that any great gain can ever be expected. Prices of lumber had not gone up previous to the war, in proportion to the increased scarcity of growing timber. Nails may come down. Labor may but it is very doubtful. The best that can be hoped is that the labor may become more productive. Other materials such as concrete, brick, etc., are even more largely made up of labor costs than lumber. There will probably be an evening up of costs so that a man may choose between different building materials more freely than now. It is likely that wooden houses may ultimately become more or less of a luxury as we have thought brick houses to be.

The most important thing however is to induce the banks which make long term loans on real estate to resume loaning on a similar ratio to cost that they formerly did. Loans of real estate for residential purposes are the safest possible investment. It costs something to handle them because so many who buy houses are for the first time saving money and they cannot always predict what misfortune may compel them to ask for more time on their loans. They necessarily have little financial reserve or none at all. However, that is the way they learn thrift. In case of necessity not caused by downright extravagance, banks can well afford to forget the purely business quality of the transaction and act slightly human.

The complaint is made from all directions that banks are loaning money for the building of moving picture houses and garages and have nothing for dwellings. That this is so shows a lack of interest on the part of the depositors in the banks. The great bulk of mortgage money is derived from the multitude of small deposits made by people who one day or another are likely to wish to buy a house themselves. A little concerted effort to let the bank presidents know that their money should be loaned to people of their own kind would be enough to change all of this. Moving picture houses pay, just now. Garages pay, just now. Both are overdone and when the time comes, as it is very likely to, that bank depositors become more thrifty and do not spend their money on movies and automobiles, these investments will be much less secure than mortgages on homes.

If the savings banks can be pursuaded to get back to their legitimate field there will be no need for manufacturers to enter on a housing program. If coupled with this a sane code of building laws can be enacted so that the builder will not be burdened with unreasonable restrictions and yet so that he cannot actually cheat the banks and the purchasers, the housing of workmen will be taken care of in the natural way by people who know the building business and who can beat out any manufacturer who takes it on as a side issue.

Setting the Tool for Multiple Cutting

By H. A. Persson,

Machinist Instructor, Southbridge, Mass., Vocational School

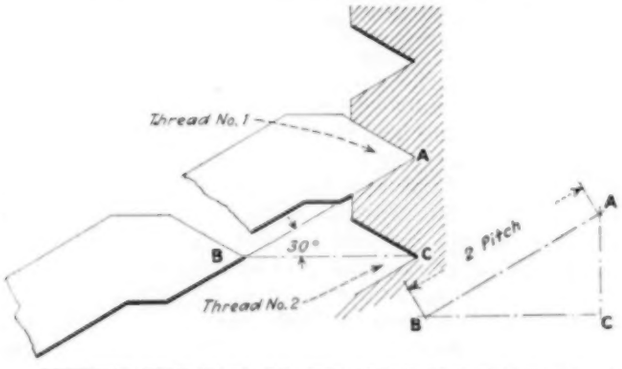
Some time ago while having a group of students build up a screw pitch demonstrator, which necessitated the cutting of single, double and triple pitch screws, with a nut to fit each, it was found that the conventional methods, such as turning gears a certain number of teeth, or the use of slotted faceplates, did not, for several reasons, produce very satisfactory results from the boys.

The idea embodied in the accompanying sketch then suggested itself to the writer, and after being tried out, was found to be so much better than any other method, that he would not now consider cutting a multiple thread in any other manner.

With the compound rest set at 30 deg. draw the compound slide back over a distance *A B* which is equal to pitch x 2, then move the cross-slide forward over distance *B C* equal to pitch x 1,732. In applying this method to the cutting of square threads it will be necessary to work from the surface; first drawing the cross-slide back over the distance *D* to avoid interference.

The advantage of this method over others will be readily noticed from the diagram, which shows the method of procedure for cutting external threads, the cutting of internal threads being even simpler, inasmuch as the compound rest is swung around to an angle of ninety degrees to the cross-slide. After the first thread has been cut the other threads are obtained by advancing the compound rest an amount equal to the pitch of the thread being cut, and feeding the cross-slide the required depth.

Whether or not this idea is original, is not known, but the writer has not, either before or since, met any one who seems to have any knowledge of it, and is therefore sending it along for the benefit of those who may find use for it.

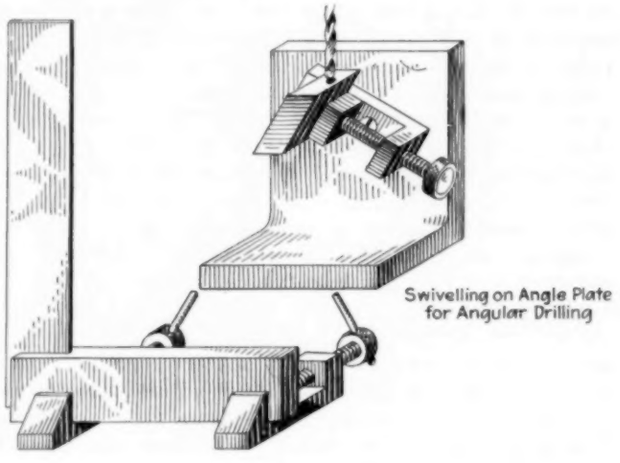


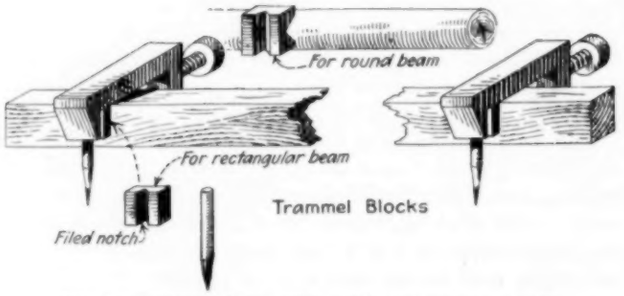
SETTING THE TOOL TO CUT MULTIPLE THREADS

Suggestions for the Use of the Toolmaker's Clamp

By H. H. Parker

The common vise-clamp which many toolmakers make, usually in pairs for themselves, is a very handy little tool and lends itself readily to many odd jobs that would be difficult of accomplishment without it. The clamp can be made very easily and quickly from odds and ends of material and with a little care in the final grinding operation to make it truly square and parallel, becomes a dependable and accurate tool. The illustration presented herewith suggests a few of the many uses to which it may be adapted.





SUGGESTIONS FOR THE USE OF VISE-CLAMP

WHAT *to* READ
—for the man in a hurry

Suggested by the Managing Editor

YOU probably cut your business eye-teeth on the well-worn saying "Money makes the wheels go round." Yet here is a man who has the temerity to dispute the correctness of this ancient axiom and to declare that the statement should be reversed, in other words that wheels going round make money. He goes on to say, "Because of this wrong approach, of this notion that it is money that makes the wheels go round, we find those who have acquired a reputation for financial acumen in business get it as a rule because of a certain skill in borrowing money, which connotes an acquaintance with bankers and banking methods. These are valuable additions to the mental equipment of any man in business, but too marked a proficiency is apt to be evidence—as uncanny skill with a billiard cue is evidence of a misspent youth—of a misspent business life."

What to read was not a difficult matter to decide two hundred years ago when books were few and magazines unheard of. It is far different now when so much reading matter is offered to pass the time pleasantly or profitably as the reader chooses. We are doing our utmost to make the "American Machinist" not only profitable but indispensable as a clearing house of ideas and news of the machinery world. This page is the editors' advertisement of their section of the paper. It gives the high spots

Mr. Basset has paused long enough in his work on the "Modern Production Methods" series to write us this unusual leading article on the "Use of Money in Business." Coming as it does in the midst of a period of depression and readjustment, it is very timely and decidedly to the point.

Very little has been heard from Austria since the outbreak of the war, but they are still doing business there even though it be on a much reduced scale. On pages 1075 and 1076 John Simon tells of a couple of light punch press jobs as handled in what is left of the old Austro-Hungarian Empire.

Part VI of Morris' Apprenticeship series begins on page 1078. The shop from which this article was secured is that of the De La Vergne Machine Co., where the apprentice system is essentially a modernized form of that used a generation ago.

For the men from the railroad shops we have abstracts from two of the railroad papers presented at the annual meeting of the American Society of Mechanical Engineers, which is in session as we go to press. The first one on page 1081 tells how engine terminals can and should be modernized to make the most of the present available equipment. The other on page 1094 attacks the same problem from another standpoint, that of making improvements in the locomotive itself.

On page 1083 Frank S. Ward tells of several interesting discoveries made in an English munition plant where the shop was turning out eccentric-headed studs. There may be an idea in this for you.

Does an Industrial Dispensary Pay? Do the employees respond to the treatment? Sanford De Hart, hospital director of the R. K. LeBlond Machine Tool Co., asks himself these and several other pertinent questions and then proceeds to answer them with facts and figures.

Someone has said that it must have taken a man with a solid concrete brain to think of building ships of reinforced concrete. Nevertheless they have been built and are being built. Fred Colvin ran across one under construction at Mobile and secured some photographs and a brief description of some of the operations. See page 1090.

It is to be hoped that the mighty wave of economy which is to sweep through Washington when the new administration takes hold, will fail to hit the patent office. This neglected department has had most of its efficiency economized out of it and what it needs just now is a little generosity. The fact that salaries have not been raised appreciably since before the Civil War is a pretty fair indication of the condition of affairs that exists there at present. The Nolan Bill which seeks to improve matters to some extent, will be reintroduced in the next session of Congress. The engineers of the country are behind this bill and the resolutions passed by Engineering Council several weeks ago show very clearly why the measure merits support. We give them in full on pages 1093 and 1094, and we hope that they will move you to write to your Congressman endorsing them.

We publish, page 1104, an address on "Conservation of Labor," by L. W. Wallace, president of the Society of Industrial Engineers. He strongly advocates the square deal, saying that any successful plan of overcoming labor trouble must have behind and in it the spirit of fairness, honesty and justice.

EDITORIALS

The Patent Office Needs Your Help

WHAT are you doing to insure the passage of the Nolan Patent Office Bill? Probably you have forgotten all about any such bill and the reason for its introduction. But the need is greater now than it was when the bill came up in the last Congress.

The patent office is a vitally important department of the United States government to every manufacturer in the country. Properly run it can serve the inventor, the constructor and the merchant well. But when allowed to deteriorate as it has been for the last seventy years it not only loses its power to aid but becomes a positive menace to the smooth functioning of business by opening the door to endless delays and litigation.

Last spring we gave you all the miserable details of the present situation in the patent office where the expert examiners after years of education and training, both legal and technical, receive almost as much as a good carpenter. The rate of pay has been increased just 10 per cent in seventy years and the work has grown far beyond that figure both in quantity and in difficulty. As a result the trained examiners have been compelled to go into commercial work and it has naturally been impossible to fill their places with men of the same caliber.

The Nolan Bill aims to correct those longstanding evils and bring the patent office back to its former wide usefulness. The bill has the support of the national engineering societies as is shown by the resolutions passed by Engineering Council which we are printing on another page. Read them and then do your part in securing the speedy enactment of this wise legislation.

K. H. C.

Neglecting the Employment Manager

ALL thinking men will agree that this is not the time to let any of our machinery of production deteriorate. It is a time to improve it in every way possible.

This is as true of systems and methods as of machine tools or jigs and fixtures. It is particularly true of the methods of employing and of training labor. For this is no time to go back to outgrown and antiquated practices just because men can now be secured without undue effort.

Those who really understand the true functions of an employment department will not think of curtailing its operation except as changed conditions make it necessary. A properly organized employment department is a great aid in harmonizing shop relations and maintaining a good spirit in the shop. And this is just as necessary now as when times are booming. Far sighted managers are utilizing the present to strengthen their organizations so that more and better work may be done when demand again becomes normal.

There are cases, however, where the decreased demand for labor has led to the abolishment of the employment department. This shows clearly that it was considered solely as an emergency measure to assist in getting men when they were scarce. It shows that all do not yet appreciate the real value of a well organized employment department.

When business begins to be normal again the shops which have their employment departments well organized will be able to get into operation much more readily than those who have let them fall by the wayside. In the meantime employment managers should study ways and means of making their profession of the greatest value, not only to the individual employer but to industry as a whole. For as Hoover and others clearly pointed out at the recent meeting of the Federated Engineering Societies, narrow viewpoints stand in the way of both harmony and progress.

F. H. C.

Repetitive Operation

FREQUENT expression is again being given to belief in the evils of repetitive operations. Some years ago much effort was expended on investigation of this evil and corrective measures were adopted in many factories. It was found that the constant repetition of a limited sequence of sub-operations seriously dulled the mind, and thereby left it easily susceptible to influences dangerous to society but attractive to the mind deprived of the ability for clear judgment. Certain rather exhaustive investigations showed that the repetitive evil, coupled with noise, was capable of very seriously lowering the morals and the quality of citizenship of the employees of a factory, and even of an entire town, where it was devoted to a class of manufacture almost wholly consisting of monotonous operations. It is easy to conceive that the way may be thus paved for the advance of I. W. W.-ism, Bolshevism and kindred destructive programs, since education properly directed, clear-headedness and individuality are the chief qualifications favorable to good citizenship, the natural enemy of destructive tendencies.

Our rapid industrial expansion previous to the war, the concentration of effort during the war and our present attempts to increase production have been responsible for neglect to a great extent in furthering corrective work. But it has not been abandoned nor forgotten. Citation of a few references to our subject by men qualified to know of its existence and its influences will show that it is a problem that at some time must be met and solved.

Herbert Hoover, addressing American Engineering Council of the Federated American Engineering Societies: "Some of the greatest of the problems before the country, and in fact before the world, are those growing out of our industrial development. The enormous industrial expansion of the last fifty years has lifted the standard of living and comfort beyond any dream of our forefathers. Our economic system under which it has been accomplished has given stimulation to invention, to enterprise, to individual improvement of the highest order; yet it presents a series of human and social difficulties to the solution of which we

are groping. The congestion of population is producing subnormal conditions of life. The vast repetitive operations are dulling the human mind. The intermittency of employment due to the bad co-ordination of industry, the great waves of unemployment in the ebb and flow of economic tides, produce infinite wastes and great suffering. Our business enterprises have become so large and complex that the old personal relationship between employer and workers has to a great extent disappeared. The aggregation of great wealth, with its power of economic domination, presents social and economic ills which we are constantly struggling to remedy. . . . We must take account of the tendencies of our present repetitive industries to eliminate the creative instinct in its workers, to narrow their field of craftsmanship, to discard entirely the contribution to industry that could be had from their minds as well as from their hands. If we are to secure the development of our people, we cannot permit the dulling of these sensibilities. Indeed, we cannot accomplish increased production without their stimulation. Here again we cannot make an advance unless we can secure co-operation between the employer and the employee. In large industry this mutuality of interest that existed in small units cannot be restored without definite organization."

L. W. Wallace, president of the Society of Industrial Engineers, addressing American Engineering Societies: "The greatest possible service that any individual, group of individuals or agency can render is that which adds to the potential value of a human being. To the degree that the potential value of an individual is increased, to that degree is society and the world enriched. At this period of the world's history its economic value is greatly lowered by the loss of millions of men. Therefore to increase the potential value of all individuals is, at this time, of the greatest importance. Not only is it of great importance to increase the potential value of all human beings, but it is of equal necessity that the energy, the vigor and morale of all be conserved."

William B. Dickson, vice-president of the Midvale Steel and Ordnance Co., addressing the fortieth anniversary meeting of the American Society of Mechanical Engineers: "Our modern system of the division of labor, consisting in the assignment of a highly specialized task to each individual workman, has deprived men of the joys which they once secured through the exercise of creative instinct in their work. The result of this condition will tend to stunt men mentally, unless it is counteracted by some other mental force. It cannot be met by reverting to original and obsolete methods; our factories must continue to produce efficiently, but not at such a sacrifice of individuality."

Labor leaders, too, seem to be grasping the significance of individualism. This is gratifying because it is inherently opposed to their present scheme of one rate of pay for all workers in a given trade regardless of their separate capabilities. Going a step further, true individualism is just as surely opposed to the closed shop.

Samuel Gompers, president of the American Federation of Labor, addressing the fortieth anniversary meeting of the American Society of Mechanical Engineers: . . . "The old feeling of craftsmanship which existed before the industrial revolution came about has been greatly modified because of the perfection reached in machine design. This process, however, has been carried entirely too far, for in many places the man has become a human connecting link in a machine and mastered by it instead of controlling the machine himself, as he did with the tools that he used in the old shop days. The result is that today man's work tends to become mere toil, so it seems to me that the task that lies before us is to develop a definite kind of working environment which will be attractive and which will inspire rather than repulse the workman. The work itself must become of central concern. This cannot be brought about unless the man finds the opportunity for self-expression in the day's work and a chance to exercise his creative impulses. . . . It is the deadly monotony of repetitive work that is at the root of most of our troubles and I, therefore, urge you engineers to direct your energies to the solution of this problem."

Matthew Woll, vice-president of the American Federation of Labor, in an address at Washington: "Permit me to point to the original idea of those who devised the various systems of what we know as 'efficiency work.' Their first concept was that the workmen in industry were to be measured just as steel and iron are measured. They overlooked the human factor. That idea has been largely abandoned, because it was the wrong idea. There is coming to be a more general understanding of the human element, the human factor in industrial life. This takes into account that mysterious thing which gives self to men, and it does not stop at the idea that men are merely the instruments through which a given amount of commodity is turned from raw material to finished product."

Such primary regulations as the single wage rate do not destroy the "opportunity" for self-expression wanted by Mr. Gompers, but they do destroy in large part the incentive which is equally necessary. And they imply a measurement of the workman in industry just as steel and iron are measured, a concept which Mr. Woll decries.

Repetitive operation has not found its way extensively into machine-tool manufacture. But the tendency to develop it exists and for that reason its serious faults should be recognized at once. Back in the days of "Chordal," of *American Machinist* fame, it was necessary to agitate for such things as washrooms with running water, in contrast to the individual and even partnership bucket, sanitary toilets, cuspidors and similar necessities of today which contribute extensive beneficial effects on the individual and therofore on the work he does. Education was necessary in regard to the advantages of the workman's owning his own home as a contributing factor toward decrease in labor turnover and lessening the number and extent of strikes. More recently there have been apparent the good results from proper welfare work to stimulate betterment and self-expression of the individual in his home life, his garden, his lawn and finally his community.

And now we must go further by overcoming the repetitive operation evil. As America is the industrial leader in, and largely through, "mass production," so must she be the leader in fostering individuality, which results from education, the opportunity for self-expression and the exercise of craftsmanship and is productive of our greatest asset, good citizenship. L. C. M.

Conservation of Labor*

By L. W. WALLACE
President, Society Industrial Engineers

SOME months ago we read an article written by Mark Sullivan entitled "The New World," in which he said, "The situation of the world this morning is that the bankers, the economists and the journalists have been making their inventories and their reports in terms of material things, of trade stagnant, of credit destroyed, of currency depreciated, of governments tottering. "But the truth is such an inventory or report should begin not with factories, or money or trade, but with human beings. Human beings are the most important element in all economic wealth. They are the ultimate source of all wealth."

We have quoted the foregoing to again remind you that the greatest possible service that any individual, group of individuals, or agency can render, is that which adds to the potential value of a human being. To the degree that the potential value of an individual is increased, to that degree is society and the world enriched. At this period of the world's history its economic value is greatly lowered by the loss of millions of human beings. Therefore, to increase the potential value of all individuals is, at this time, of the greatest importance. Not only is it of great importance to increase the potential value of all human beings, but it is of equal necessity that the energy, the vigor and morale of all be conserved. The methods whereby the potential value of human beings may be increased and conserved are not entirely unknown or untried. Many demonstrations of actual accomplishments are on record. We shall not have the opportunity of discussing such methods in detail, but we hope to indicate to you some possibilities and to suggest some fundamental principles.

Work of Safety Advisors

One of the best pieces of work that has been accomplished in recent years in conserving the physical vigor of labor has been that done by the safety advisors. The safety movement has saved untold millions of dollars and thousands of human lives. It is one outstanding example of what a systematic organization can accomplish. The way in which standard practice has been established is indeed remarkable.

Many have been the discussions as to the functions and the value of the welfare advisor.

However welfare work may have been exploited, however badly handled, however disliked, yet all those who are conversant with this subject must admit that an untold amount of good has been accomplished through such efforts. There is unquestionably still a need and a place for it in American industrial and commercial life. To accomplish the most lasting and the most wholesome results, it must be administered in a different manner and from an absolutely changed point of view than previously. As a sop it is a failure; as a substitute for wages justly due, it is pernicious; as paternalism, it is dangerous. If administered as supplementary to fair and full wages—if conceived as giving that justly due—if guided by the sincerest motives and if participated in through the spirit of human kindness and cordiality, it will be a benediction and will result in maintaining a high morale, a better moral and physical condition of the worker and his family—thereby obtaining a more virile manhood through which business and society will profit.

Ill Health Means Inefficiency

The industrial medical advisor is an absolute essential in this day of intensive and mass production.

To quote: "Investigators tell us that only one industrial worker out of five in need of a physician calls on one. What is the connection between these two facts and the lost time in the plant? There must be some relation between the physical condition of workers and industrial accidents; between the deterioration of physical health and labor turnover; between facts noted above and the impressive number of chronic invalids; between the great number of persons who are only casually employed and the unemployable . . ."

The loss in wages to the employee must be very large and the loss to the employer much larger when it is remembered that bad health plays a large part in inefficiency; in irregularity in attendance, which results in a lower standard of living; in the shifting from job to job, which reduces stability of character.

It is these considerations that have led a large and growing number of factory managers to add to their staff the industrial physician. That his work has been valuable is unquestionably true as many know. We are told that in one plant where the health conditions were properly supervised teh absence from work in the plant was only approximately 3 per cent, whereas the average for other shops in the same vicinity, where preventive work was not done, was 10 per cent.

In a published statement, the Norton Co., of Worcester, Mass., says that a 75 per cent reduction in loss of time on account of illness has been obtained since the establishment of their medical department.

If by conservation of labor we imply the making of labor more contented, more intelligent and therefore more effective, then some forms of industrial engineering will be most effective. The intelligence of all labor must be raised. Arthur Williams, of the New York Edison Co., made a very true statement some time ago when he said, "If those who have written the history of civilization from its beginning down to the present are correct in their conclusions, the greatest forces vital to the progress of the human race are the moral and the intellectual. To be willing to perform our duty is the moral part; to know how to perform it, is the intellectual part; while the closer these two parts are knit together the greater the harmony with which they work and the more securely shall we lay the foundation for the further advancement of mankind.

"The intellectual part can be developed only through education. The training must be broad in character and so carried on as to develop the individual mind and inspire the individual to strive for a standard of accomplishment as high as the individual can conceive. Other things being equal, the trained mind always excels the untrained mind."

There is a great need in this broad land of ours for

*Address delivered at the first meeting of American Engineering Council of the Federated American Engineering Societies, Washington, D. C., Nov. 18, 19 and 20.

more education—education of the type to benefit the masses, an education that will enhance the breadth of vision and the potential possibility of every individual. As the general intellectual level is raised there will be more peace and harmony and a larger recognition of individual responsibility. It is ignorance that accounts for much of the dissatisfaction, discontent and violence which have been so evident in recent months.

The need for education, however, does not end with the general education, for there is a very great need for more general and better industrial education. The term industrial education is herein used in a very broad sense. We have in mind not only the education of the worker at the bench or lathe, but the sub-foremen, the foremen, the superintendents, the engineers, the managers and, yes, the chief executives. We sometimes feel that it is the last-named class that is in a greater need of a course in industrial education than any other one group.

It is our conviction, founded upon a rather intensive study and observation of industrial affairs for several years, that much that is evil, that is inefficient, that is troublesome in the industrial realm of the world is due to lack of information, which leads to a misinterpretation of causes and effects. This ignorance permeates every human element connected with industry. The employer oftentimes does not know any more, if as much, about the real economic situation as does the employee. The employee does not have a correct conception of the laws of management, the methods of manufacture, the cost of production, hence is easily persuaded to believe that the management is domineering, that its methods of manufacture are oppressive and wrong and that the employer is making enormous profits. As a result of lack of knowledge on the part of both parties, grievous mistakes are made; rank injustice results; estranged relationships become a fact. The employer, employee and the public suffer mentally, physically and financially. This condition can best be eliminated through a broadly conceived and wisely administered form of industrial education. Such a form of industrial education would inevitably result in increased production through the efficiency that would arise from trained workmen.

Decided progress has been made in training workmen. This was especially evident during the war. However, in all such efforts not enough stress has been placed upon the fundamental principles. The effort has centered too much upon training the worker to be an effective piece of machinery and not enough emphasis has been placed upon the factors that are conducive to making the workman a broadminded and an intelligent employee. The intellectual development has been too often sacrificed for the sake of the physical as expressed in the dexterity with which the worker performs his task. Indeed some intellectual development resulted but not a sufficient amount to be of material consequence in enabling the man to have a greater appreciation of his responsibility as an employee, as a prospective executive or employer, as a citizen and as a member of society, which are important and should be an unfailing thought back of the purpose. And again, if this phase of the training be neglected there will not be an ample amount of intelligent material from which to select the subordinate executives. And it is in the foreman group where is found a very sad condition. It is one of the weakest chains in the entire industrial system. It is no wonder that there is so much waste of material, of time, of labor in the industrial plants, when one is conversant with the poor leadership. There is no greater opportunity for accomplishment in industrial education than among the foremen.

If there be developed a large and a better trained group of industrial leaders, a very advanced step will have been made toward conserving labor, as measured in its increased efficiency, through better methods of management and more constructive leadership, and through an increased mutual and physical vigor produced by more wholesome working conditions and surroundings.

Noah Had Labor Troubles

The strike is a very large source of waste of human labor. Millions, I do not know how many millions, of hours of labor are lost each year through strikes. All of this loss could be conserved if the strike could be entirely eliminated, but we do not believe that this will ever come to pass. We are reminded that "ever since the time that the first carpenters started to work for Noah & Co. on the Ark, there have been conditions arising in the manufacturing business that have been more or less of an annoyance to the employee, and generally a thorn in the side of the employer."

That statement was contained in a letter addressed to a manager of a prominent manufacturing company by an employee. In the letter, the employee sought to make clear that certain internal conditions needed to be changed in order that the employees might more fully enjoy their work and consequently be happy, contented and efficient.

The reason for quoting the statement is to remind you that from time immemorial there have been labor problems and it is our conviction that, since labor problems have always existed, so they will continue to arise as long as humanity is constituted as it is. Therefore, I do not anticipate that at this time, or at any future period, there will be evolved a panacea that will forever solve any and all problems that may arise between employer and employee.

This is no more possible than that a plan can be evolved whereby there will be no more wars between nations. Indeed plans can be formulated and principles can be laid down which will greatly reduce the probability of labor disputes and which will eliminate the likelihood of many wars. Some form of industrial democracy on one hand and a league of nations on the other unquestionably will be agents of great value and influence, but those agents within and of themselves will not eliminate labor troubles, nor make impossible future wars.

In recent weeks we have heard much about the efficacy of industrial democracy, of shop committees, of Senate and House plan, of collective bargaining, as the panaceas for all labor problems. During the same period we have had striking examples of the inadequacy of all these plans. Industrial democracy is a misnomer unless fairly and honestly applied. Collective bargaining is a great danger if wrongly applied and is used as an instrument of autocratic power.

Fair Play the Only Panacea

No, labor problems have always existed and are likely to continue. There is no panacea, as industrial democracy, profit sharing, committee system, open shop, closed shop or collective bargaining. None of these agencies will accomplish or avail much unless there be behind them and disseminated through every fiber and thread,

the spirit of fairness, honesty and justice. If these principles be present, there will be no labor troubles. And again, if they be present, it does not matter much what plan is used. This accounts for many striking examples of the successful management of labor through each of the plans named. Because these successful examples can be pointed out is the reason for the confusion in the minds of many—whereas if a close analysis be made, it would be found that the wholesome conditions existing in each case were not due to the plan in vogue, but to the fact that the employer and the employee each in turn, was a believer in, and a practicer of, the cardinal virtues of honesty, fairness and justice. The unfortunate thing is that many employees, many employers, many associations of employers and many labor organizations, have violated and ignored these principles. Through the utter disregard of them, great damage has been done, and, to quote: "Great powers have been used arbitrarily and autocratically, to exact unlimited profit or compensation by both capital and labor. This policy of exacting profit rather than rendering service has wasted enormous stores of human and natural resources, and has put in places of authority those who seek selfish advantage regardless of the interests of the community." The problem before the American public is to evolve those plans and to inaugurate those policies that will make it a great offense against the community, for any such arbitrary power to evoke its wrath against the will and against the welfare of the masses. Such plans should provide severe and sure punishment for the autocratic employer or autocratic labor leader who wilfully violates the principles of economic justice and by such violations brings hadrships, despair and heartaches upon the masses.

Many of the abuses have grown up through ignorance of cause and effect. Poor management, watered stock, incompetent supervision, excessive equipment, large inventories, poor equipment, bad management, inadequate sales policies and other causes have resulted in reduced income and a loss of net profits. Lack of information as to the causes leads to a misinterpretation of the reason for the effects. In arriving at a solution, incompetency in management again shows itself; faulty analyses and incorrect conclusions follow. Wages are cut, demands increased, working conditions made less desirable; all of which result in strained relationships, strikes, bloodshed, destruction of property—no one benefited.

Lack of information as to cause and effect on the part of labor leads to many misinterpretations and faulty conclusions, such as to believe that to limit production is to benefit the worker, to unduly decrease the length of the work-day is conducive to the prosperity and the well being of society and of labor and to place all workers in a given trade on a par, regardless of capacity or ability, is beneficial to the cause of labor. These policies lead to a reduction of production, increased cost; to suspicion, to disregard of rights of property, to rights of individuals and to rights of society, the result being strained relations, strikes, bloodshed, destruction of property—no one benefited.

Mission of the Industrial Engineer

It is the function and province of the engineer to make the correct analysis, to predict effect through known causes. It is purely the mission of the engineer of wide experience, of great foresight and of unselfish motive to see to it:

First—That every action is based upon the principles of honesty, justice and fairness to the employee, the employer and the public.

Second—To so formulate the plan of action as to eliminate all unfair privilege of employer and employee and to make it possible for each to fulfill its responsibilities to the community.

Third—To so organize the plan or industry as to make it exceedingly difficult for an incompetent to hold a position of authority or to have autocratic control.

It is the industrial expert who must finally work out these problems. He is the specialist who understands causes and effects. He is the one to make an unbiased and detailed diagnosis and to prescribe the treatment. His treatment may at times be severe, may never be the same for any two cases. It must always be honestly and fairly given, and to be for the good of the employer, the employee and the community. If the industrial expert is to be of the greatest possible value to society, his conduct, his professional actions and attainments must be such as to merit the confidence and respect of society in general.

The various phases and angles to human relations have not been analyzed as they should. The world has lost millions of men through the ravages of war. This loss does not only affect the present, but future, for generations to come will realize the loss of these men and their potential posterity. To offset this loss, the industrial engineer must devise new plans, new methods, new equipment.

To offset this loss the engineer must give consideration to devising means of using that large army of industrial handicaps. Men and women who, through accident or through miscarriage of the laws of nature are lacking in some essential faculty or sense. A close analysis of the jobs of work to be done in modern industry will disclose that in the modern industrial plant there is an opportunity for men and women with every sort of handicap imaginable to do successfully some piece of work. It is the duty and responsibility of the engineer to relieve industry and society of such expense and loss, by making it possible for men, however handicapped, to find useful employment.

Think of the many hours being wasted, with all that means to posterity, to society, to industry, because we have not analyzed the requirements of the job and because we have not trained the man. The engineer cannot afford to overlook this potential labor supply and this potent opportunity to save mankind and society by restoring to an economic and social standard the so-called handicapped.

We have not the time to further discuss these matters, but we wish to emphasize that many of the angles of the present day industrial situation clearly come within the purview of the industrial engineer. He is the hope; will he meet the occasion with vigor, with enthusiasm, with fairness, with sufficient prestige to put it over? We sincerely trust he may. Great the pity if he does not. So look well to your oars and into your stroke put all the constructive effort that pure manhood, wise judgement, tried experience, sincere and accumulated wisdom will permit.

And out of it all, we hope, there will eventually come into all industry because of the effects of the engineer, a fine spirit of comradeship, of loyalty and of genuine pleasure in association of boss with men, which if it does will be one of the largest possible means of conserving labor in all its aspects.

SHOP EQUIPMENT NEWS

-Edited By-
S. A. HAND

SHOP EQUIPMENT • NEWS •
A weekly review of modern designs and • equipment •

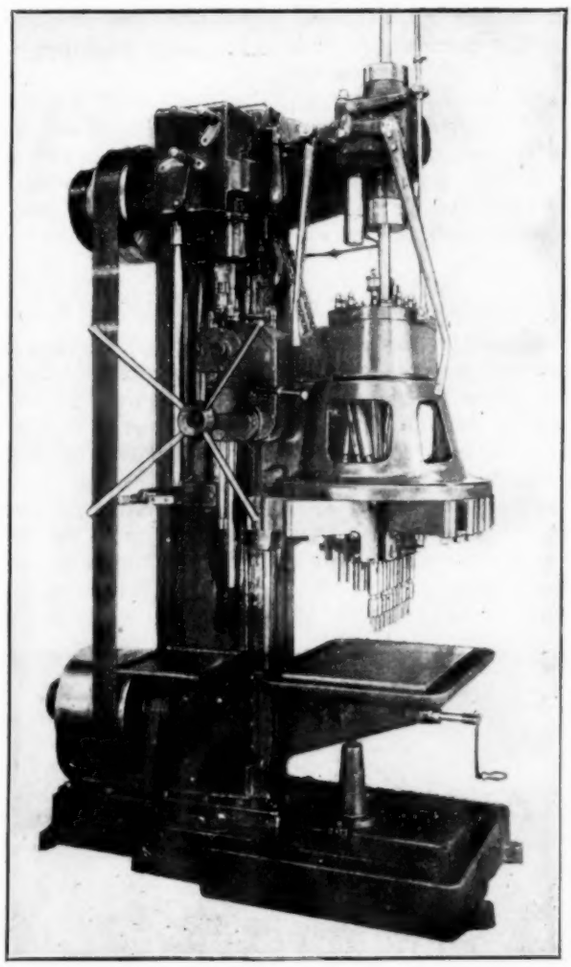
Descriptions of shop equipment in this section constitute editorial service for which there is no charge. To be eligible for presentation, the article must not have been on the market more than six months and must not have been advertised in this or any previous issue. Owing to the news character of these descriptions it will be impossible to submit them to the manufacturer for approval.

• CONDENSED • CLIPPING INDEX
A continuous record of modern designs • and equipment •

Fox Multiple-Spindle Tapping Attachment

The Fox Machine Co., Jackson, Mich., has placed on the market a tapping attachment for use on its multiple-spindle drilling machines. It is necessary that some changes be made in the machines when they are equipped for tapping, the drive-shafts being mounted on ball bearings.

The machine shown in the illustration is of the D-22 type equipped for drilling and tapping, the tapping mechanism being applicable also to the D-12 and to the D-32 types of drilling machines. It is stated that the machine illustrated has tapped twelve ⅝-in. holes in cast-iron plates 1¼ in. thick in five seconds, a maximum of 6 hp. being consumed.



FOX MULTIPLE-SPINDLE DRILLING AND TAPPING MACHINE NO. D-22

The upper drive pulley at the rear of the speed-change box is mounted on a plate friction clutch. By means of a lever at the front the clutch can be operated for stopping and starting the machine. On the vertical drive-shaft to the head is a 12-jawed positive driving clutch having 12 right-hand teeth on one side and 12 left-hand teeth on the opposite side. These teeth can engage opposing clutch members driven by a bevel pinion mounted on the horizontal shaft which runs into the speed-change box. The movement of the clutch from the forward to the reverse position is controlled by a lever at the front of the machine. This lever is so connected to the lever which operates the friction driving clutch that when the tapping lever is moved from the forward to the reverse position, or vice-versa, the first movement disengages the friction clutch driving the machine.

Further motion of the tapping lever carries the toothed driving clutch from one position to the other, this being accomplished while the power is off from the spindles. After the positive clutches are in engagement the final motion of the tapping lever allows the friction clutch to engage, thus driving the spindles in the reverse direction. Provision is made against the possibility of the teeth of the clutches striking on top of each other when being reversed which would prevent the clutches from engaging.

When the tapping attachment lever is pulled forward the spindles are given a right-hand rotation, and a strong, inclosed spring is put under compression and latched in this position. Upon the vertical stop-rod is an adjustable stop which can be set so that when the taps reach the desired position, the stop comes in contact with the trip arm and releases the spring. The movement of the spring then carries the tapping attachment lever automatically from the forward to the reverse position so that the operator does not have to trip the tapping mechanism when the desired depth is reached.

After the tapping attachment lever is thrown forward and the automatic trip locked in position the operator can manipulate the tapping lever back and forth if he desires to reverse the taps after starting into the work and before they reach their bottom position. This is of importance in the case of breakage of a tap. The reversing does not, however, affect the tripping of the mechanism when the taps finally reach their lowest position. The positions of the spindles carrying the taps can be changed to suit different layouts for different jobs.

Oliver No. 80 "Variety" Saw Bench

A wood-working machine that is intended to be of particular service in a shop doing general work, is built by the Oliver Machinery Co., Grand Rapids, Mich. It will do ripping, cross-cutting, dadoing and gaining, and can be furnished with a special table equipment that permits it to be used for boring and mortising.

The machine, shown in Fig. 1, has a capacity for ripping boards up to 23 in. in width when using a universal ripping fence, or 27 in. in width with a plain ripping fence. It will cut off material 32 in. wide by 3 in. thick with a saw 14 in. in diameter, or 4 in. thick with a 16-in. saw. The same saw is used for both ripping and cross-cutting. Dados can be worked up to 4 in. in width. The mortising and boring attachment, the small table of which can be seen at the right, will bore holes 2 in.

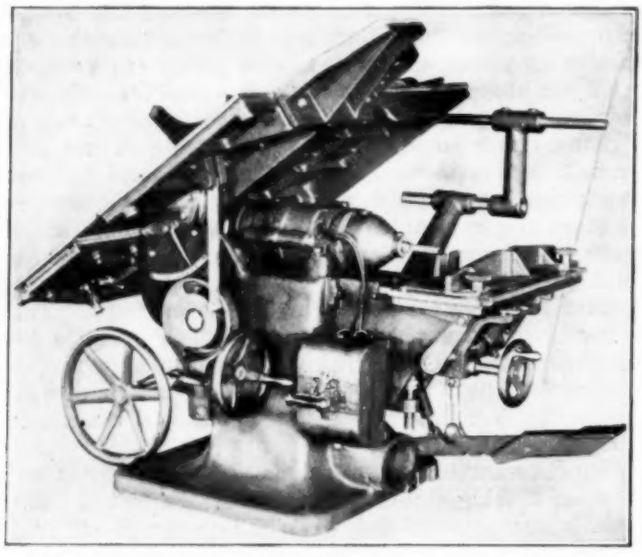


FIG. 1. OLIVER NO. 80 "VARIETY" SAW BENCH WITH TABLE TILTED, SHOWING MORTISING ATTACHMENT

Specifications: Table; universal or plain, 36 x 44 in. Universal table; tilts to 45 deg.; movable section, 15-in. wide; vertical adjustment, 4 in. Capacity; ripping, 23 or 27 in. wide; cross-cutting, 32 x 3 in.; dados, 4 in. wide; mortising, ¾ x 4 in.; boring, 2 in. diameter by 6 in. Saw arbor, 1 in. diameter. Driving pulley; 600 r.p.m.; 18 x 5 in. Motor drive; 5 hp.; 1,800 r.p.m. Weight; crated, 1,650 to 1,700 lb.; boxed, 1,850 to 1,900 lb. Export box, 60 cu.ft.

in diameter to a depth of 6 in., or mortise holes up to ¾ in. square by 4 in. deep.

The base is a single casting of box section. The dust chute is part of the base and extends through its center to a flanged discharge opening on the right-hand side.

The table is of ribbed construction. It may be tilted to an angle of 45 deg. toward the left in the manner shown in the illustration. Plain or universal types of tables can be furnished, the latter type having a moveable section 15 in. wide mounted on ball-bearings, which permits it to be moved forward and back with slight effort. This moveable table can be seen at the front in Fig. 2. By means of a pin it can be locked in a stationary position when so desired. It may be moved as much as 4 in. from the saw, thus permitting the use of a dado saw or special head.

A handwheel can be used to raise or lower the table for a distance of 4 in. Tilting the table is accomplished by a handwheel operating through a worm and gear connected with the table by a link. A graduated dial is provided to aid the operator in adjusting for any angle.

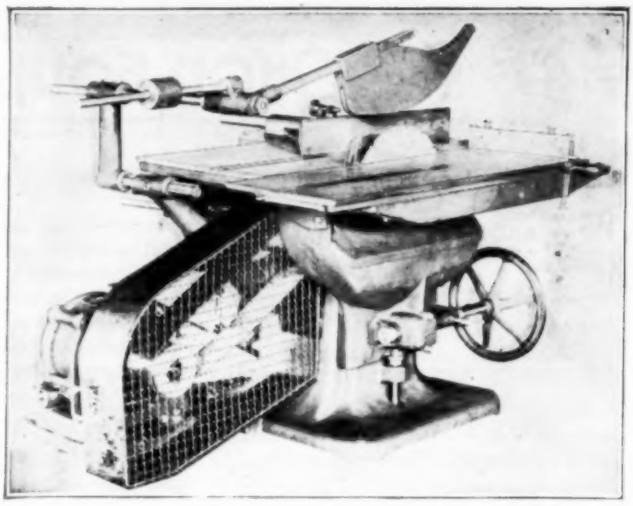


FIG. 2. OLIVER SAW WITH BELTED MOTOR DRIVE

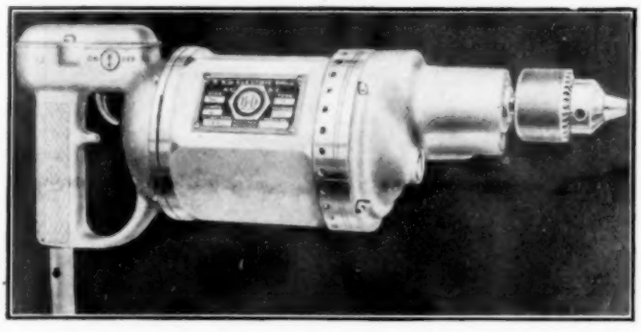
Two interchangeable forms of arbor-head are built, the belt-driven and the direct motor-driven. The saw arbor is 1 in. in diameter and mounted on ball bearings that are completely encased to exclude dirt. The end of the arbor opposite the saw is used to carry the boring and mortising tools, a feature that can be easily seen in Fig. 1. The table of this attachment is supported by a heavy bracket which may be adjusted 3 in. vertically on gibbed ways. An adjustable pedal is used to move the table in and out. The application of the attachment makes the machine of service when other machines doing such work are not available.

A universal ripping fence, miter cut-off gages and guard are furnished as regular equipment. When belted drive is used, the motor can be mounted on an extension of the base, as shown. A roller-bearing countershaft can be mounted in place of the motor, if drive from an over-head shaft is desired.

Black and Decker Body-Builder's Drill

The quantity manufacture of automobile bodies calls for a hand-portable drill which has speed and endurance and which is light and can be easily handled. The Black & Decker Manufacturing Co., 661 Liberty St., Baltimore, Md., has recently placed on the market an electric drill for body building that will drill holes up to ⅞ in.

The gears are made of hardened steel. Light weight is obtained by making the entire housing of the motor and gears of aluminum alloy. The motor is cooled by forced circulation of air through the motor and the windings, and is said not to heat up even when used con-



BLACK & DECKER HAND-PORTABLE DRILL FOR BODY BUILDING

tinuously. The motor develops ¾ hp. and has a no-load speed of 1,480 r.p.m. A pistol-grip handle is furnished, and the control switch is operated by means of a trigger, the arrangement being shown in the accompanying illustration.

The drill is equipped with a three-jaw chuck for holding straight-shank drill bits, 15 ft. of duplex electric cable and separable attachment plug. The motor runs on either alternating or direct current and can be supplied for 110, 220, or 32 volts.

Langhaar Self-Adjusting Ball Bearing

The Langhaar Ball Bearing Co., Aurora, Ind., has placed upon the market a ball bearing that is intended to carry high thrust loads as well as radial loads. It is stated that the bearing has been designed to meet the requirements and principles of ball-bearing design published in the transactions of the American Society of Mechanical Engineers in May, 1907.

Fig. 1 shows a sectional view of the bearing. It can be seen that there are two rows of balls, each one having an independent ball cage or spacer cut from a ring. Between the rows of balls are two rings separated somewhat by small slightly curved pieces of spring steel held between them. This is the self-adjusting feature of the bearing, as it allows the two rows of balls to suit themselves to their proper positions in the races, applies only a definite pressure to them and adjusts for wear.

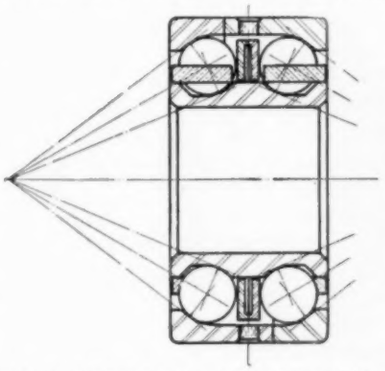


FIG. 1. SECTIONAL VIEW OF LANGHAAR SELF-ADJUSTING BALL BEARING

It is said that the lines of contact of the balls with the races form cones, as shown in the sketch. Spinning and grinding of the balls is said to be largely obviated. The inner race is solid. The outer one, however, is made in two parts, as can be seen in Fig. 2. The parts fit together in the manner of jaw clutches, and are fastened by the inserting of pins in holes provided at the joints. A substantial case is thus made, the appearance of the assembled bearing being shown in Fig. 2.

It is claimed that the bearing is adaptable to any speed ordinarily used, having proved reliable and satisfactory at speeds as high as 8,000 r.m.p. It is stated that a thrust load as large as the radial load can be carried.

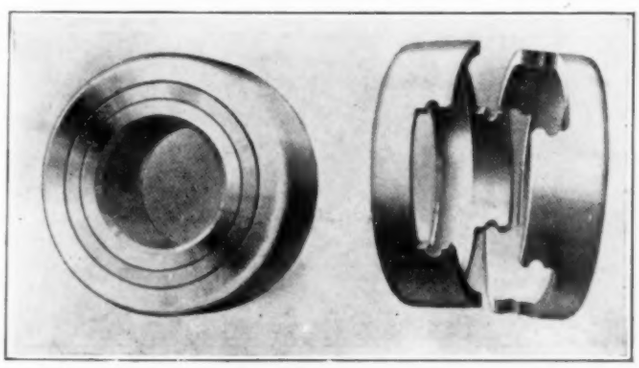
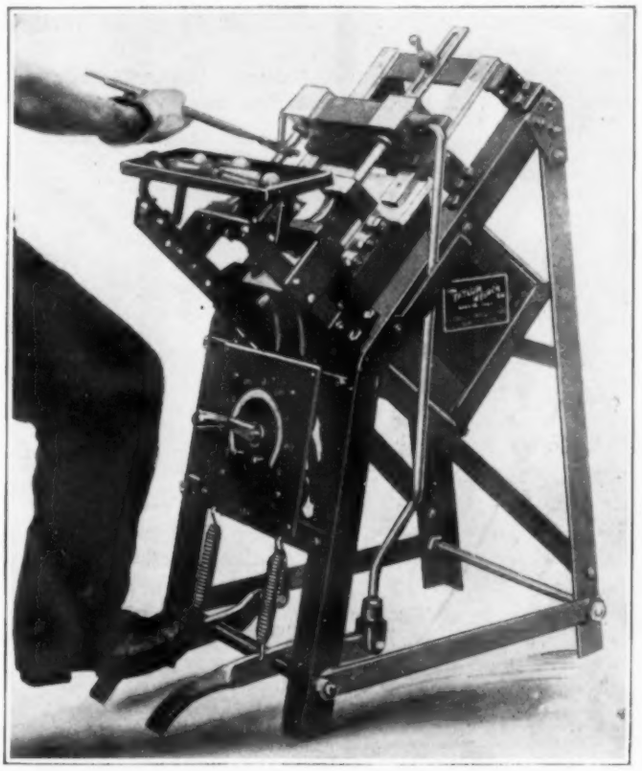


FIG. 2. LANGHAAR BALL BEARING AND TWO-PART OUTER RACE

Taylor Electric Rivet Heater

An electric rivet-heating machine has recently been placed upon the market by the Taylor Welder Co., Warren, Ohio. The illustration shows the method of operation, the operator handling the rivets with tongs and actuating the dies by means of a pedal.

The machine is intended to hold two rivets at a time, it being stated that an operator can be kept busy handling this number, since a ¾ x 4-in. rivet is heated in about 30 seconds. The angle at which the rivets are tilted keeps them in plain sight of the operator, so that they can be removed when at the proper heat. A 6 x 16-in. tray is provided at the front of the machine for holding rivets. It is not necessary to actuate a switch for each rivet, as the circuit is automatically closed when the rivet is placed in position for heating.



TAYLOR ELECTRIC RIVET-HEATING MACHINE

The machine is made of angles and plates, permitting light weight. It is intended for permanent installation in one place, but can be provided with a bail so that it can be picked up and moved by means of a crane.

The machine is equipped with a 15-kw. transformer and a five-step regulator for controlling the current. The transformer is air cooled and the capacity is sufficient to prevent overheating in continuous operation. It is stated that the cost of operation is low, the power consumption being approximately 18 kw.-hr. per 100 lb. of rivets heated.

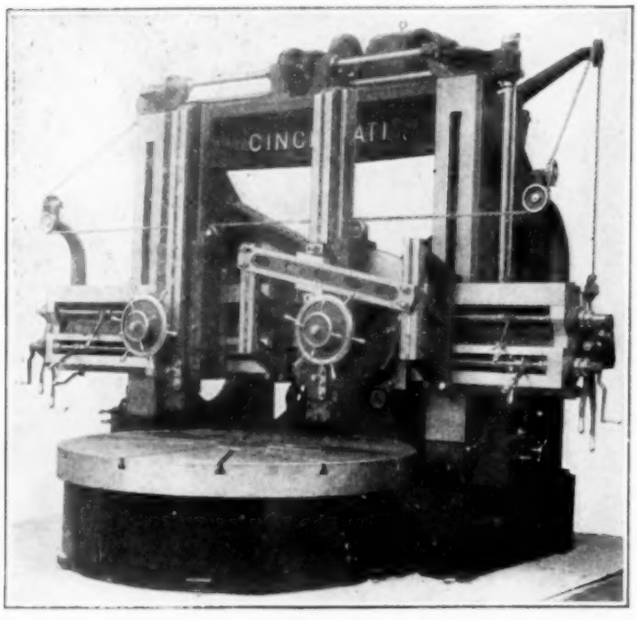
The extreme height of the machine is 40 in., the dies being 32 in. above the floor. The floor space required is 31 x 18 in. and the weight about 400 lb.

Taper Attachment for Cincinnati Boring Mills

For turning and boring tapers approaching nearly a horizontal line and to suit which the swiveling head is not adaptable, the Cincinnati Planer Co., Cincinnati, Ohio, has brought out a taper-turning and boring attachment. The device, shown in the illustration on an 8-ft. mill, is intended for use on all sizes of boring mill from 42 in. up to 12 ft.

The principal parts are a slanting member or sine bar, sine-bar supports and the sine-bar guide fastened to the ram. In order to provide up and down adjustment to the ram, without loosening the sine bar and thereby changing its position, the face of the ram is machined and fitted with a T-slot equal in length to the vertical travel.

When mounting the attachment, the sine-bar supports, the sine-bar guide and sine bar are first placed



TAPER ATTACHMENT ON A CINCINNATI BORING MILL

in position loosely, and then clamped securely in place after the proper angle has been determined. The power feed to the ram is disengaged by means of the small handwheel, so that the ram is fed vertically as the head traverses. The use of the attachment is recommended for angles up to and including 18 deg.

Durkee Defectoscope

A device for the testing of steel magnetically, and known as the defectoscope, has recently been placed upon the market by the Durkee Manufacturing Co., Grasmere, S. I., New York. It has been invented and developed by Dr. Charles W. Burrows. The instrument is intended for the examination of commercial steel products, being a means of checking the physical uniformity and structure of the work under examination by determining the variation in magnetic homogeneity along the length of the specimen. It is especially adapted for use in locating defects in steel wire, cables, rods, rails and bars.

Fig. 1 shows a general view of the defectoscope arranged for testing rails. The device consists of several distinct elements. The first one produces the

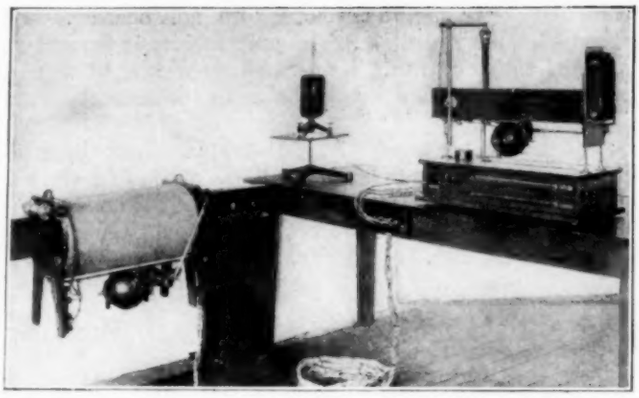


FIG. 1. DEFECTOSCOPE SET UP FOR THE TESTING OF STEEL RAILS

magnetizing effect, being a relatively short solenoid energized by commercial direct current, so that the magnetization of the specimen is carried well beyond the knee of the induction curve. The solenoid is mounted on a carriage which can be driven along the rail at a uniform rate by the small motor under the coil. The rail is mounted upon steel supports connected by an auxiliary rail, so that a closed magnetic circuit may be formed.

The next element is the means for detecting the magnetic variations in the rail. It consists of two test coils surrounding the specimen, having the same number of turns each and rigidly connected to the magnetizing solenoid. When the carriage moves, the detector occupies different positions along the length of the rail, and, if the specimen is not quite uniform, the magnetic induction threading one of the coils is different from that threading the other, the electromotive force also being different.

This differential emf. is impressed upon a device for indicating its magnitude, a heavily damped D'Arsonval galvanometer of short period being used for this purpose. The indication given by the galvanometer, shown at the left end of the table, is recorded by means of the camera at the right.

The recorder consists of a photographic film caused to move uniformly across a small slit through which a ray of light is reflected by the galvanometer through the dark box. The small motor under the bottom of the dark box furnishes the motive power for the film.

The control box, shown on the table underneath the dark box, contains all the switches and rheostats necessary for the operation of the apparatus. The ammeter for indicating the current in the magnetizing solenoid and the electric lamp used for the reflecting galvanometer are shown mounted on the control box.

FIG. 2. MAGNETIZING AND FEEDING ARRANGEMENTS USED WHEN TESTING RODS

When making a test the carriage is caused to be moved along the work, the film being exposed at the same time. The film can then be developed to show the record of the magnetic homogeneity of the rail, the straighter the line on the film the more uniform being the structure of the specimen. If a permanent record is not desired, the photographic part of the equipment may be replaced by a translucent scale or a telescope and scale for optical observation.

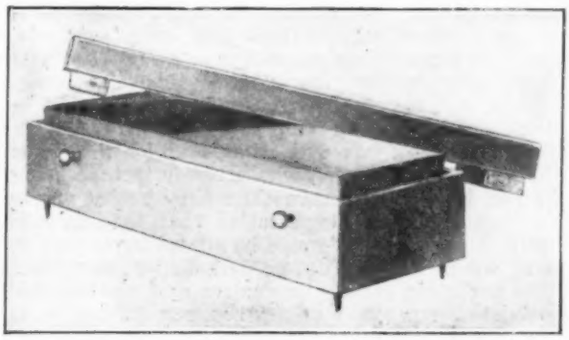
When small specimens are to be tested, it is usually more convenient to have the solenoid stationary. Fig. 2 shows the arrangement used for testing rods, a small motor moving them at a uniform speed through the solenoid. The detecting and recording arrangements are the same as used with the other type of solenoid. A somewhat similar arrangement is used for testing cables and wires, the solenoid being kept stationary. It is said that the device can be mounted whenever desired, so that wire in the course of manufacture may be tested. When testing cables, a break in one wire will be shown by a notch in the original straight line of the record. Instruments have been developed for testing various parts of symmetrical shape, such as races for ball bearings.

It is said that the defectoscope can well be applied to the testing of steel in the process of manufacture, as between operations or before and after heat treatments, and that only moderate skill is required of the operator. Accurate results are claimed, as the effects of heat treatment and chemical composition upon magnetic properties are known. The process is, of course, not destructive to the specimens under test.

Raughtway Self-Cleaning Oil-stone Holder

The oil-stone holder shown in the illustration has been placed on the market by J. A. Raught, 1006 Grand Ave., Racine, Wis. It is made of cast aluminum, the surfaces being ground and polished. There are four sharp pegs in the bottom of the holder to prevent it from slipping on the bench. The cover is provided to exclude dirt.

The stone rests on four buttons ¼ in. high on the bottom of the holder and is prevented from shaking in the holder by four screws in the sides. The stone lies in a bath of oil, thus keeping one side of it soaked. It is claimed that by this method the stone can be prevented from clogging and glazing, as it is kept clean and sharp. The holder is made in sizes, to hold stones 1 in. thick, 2 in. wide and either 6, 7 or 8 in. long, and it can be furnished either with or without the cover as shown.

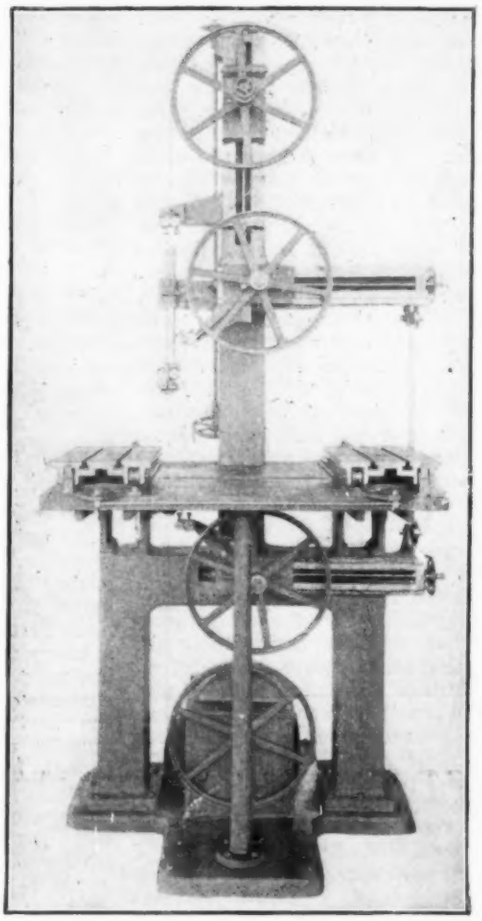


RAUGHTWAY SELF-CLEANING OIL-STONE HOLDER

Seattle Metal-Cutting Bandsaw

The Seattle Machine Works, Inc., 37-51 W. Lander St., Seattle, Wash., has recently built the metal-cutting bandsaw shown in the illustration. It is intended for cutting out solid forged crankshafts, for cutting slots, and for cutting pieces to length. This is accomplished by having the saw cut on both sides of its loop, its motion, of course, being downward on one side and upward on the other.

In order to change the distance between the two cutting portions of the blade, two idlers having horizontal movement are provided, the screws in the slides being connected by means of a chain running on sprockets so that they operate simultaneously. The top wheel is adjusted vertically by means of a handwheel, so that the saw can be kept tight for any position of the idlers. The machine can be used as an ordinary bandsaw to make a single cut by moving the idlers out of contact with the saw.



SEATTLE METAL-CUTTING BANDSAW

The saw is driven by a motor mounted in the base. The work is rested and clamped upon two carriages on the table of the machine. The carriages are mounted on rollers, so that weights hung at the back of the machine and fastened to them furnish the pressure for the cut. In order to take a single straight cut in a long piece of work the cutting blade can be twisted slightly, the idlers being run out to the right. The movable carriages can then be swung so that the direction of their travel will be parallel to the cutting portion of the blade. In this way the work will clear the upward-traveling loop of the saw.

General Business Conditions

Many Branches Covered—Past and Future Discussed—Labor and Retailers

The downward movement of prices, of which the first signs appeared last May, and which became quite evident in October, has become more general and precipitate in the last month. The hopes that had been entertained that the descent to a lower level would be accomplished so gradually that the losses would be covered by current profits, without serious interruption to business and without unemployment, have proved illusory. Rarely, if ever, has there been so great a decline in commodity prices in so short a time. The twelve basic commodities included in the price table of the Federal Reserve Bank of New York, to wit: wheat, corn, hogs, sugar, pig iron, copper, lead, lumber, petroleum, cotton, hides and rubber, have declined on an average 33.5 per cent since the high point of the record in May.

Petroleum is the only one of this group which has not suffered severely, and owing to the growing demand for fuel oil, gasoline and the other products it has scarcely suffered at all. All of the others have been forced lower during the past month, and ended the month without improvement.

The Bureau of Labor figures, October average based upon about 325 commodities, were 7 per cent below September, and 7.3 per cent below the May average. As compared with October, 1919, the table shows a decline in articles of food of 3½ per cent, cloths and clothing nearly 18 per cent, and farm products 21 per cent. Bradstreet's table of consolidated prices is down 24.8 per cent from its peak, which occurred in February.

Industry and Trade

Industrial activity was generally well maintained throughout October, notwithstanding the reduced operations in the textile mills and shoe factories. Raw cotton consumption was the lowest for any month in the last four years. Building activity has declined, and unemployment has increased in the past month. The coal situation is improving and prices are declining, although dear coal is a serious factor in production costs.

Trade is reported light for this season of the year, and the railways having cleaned up for the most part the congestion which existed in the spring and summer, are having some falling off in traffic. The grain movement from the farms is light. Outside of New York City payments through banks are fairly well maintained, being reported by the Federal Reserve Bank for the week ending Nov. 24, as 6.7 per cent below the corresponding week of 1919. Including New York City, the falling off is 9.2 per cent, but business was very active and prices were high in November, 1919.

Evidently current conditions are not yet reflected in the volume of payments, for industry has slackened decidedly during November and wholesale trade is very slow. The business which should be going on now in orders for the retail trade of next spring is not being done. This is especially so of shoes, clothing, dress goods, underwear, knit goods and the textiles generally, but is true in all lines.

The Farmers' Losses

The fall in prices of farm products during the past month has given a more serious aspect to the entire business situation. Following the declines in September and October the cuts again have been very deep, and are of far-reaching influence. When the price recessions occurred in the months following the armistice and a general reaction in business seemed to be imminent, farm products were sustained by a heavy foreign demand, and with the buying power of the farm population sustained, a good general trade over the country was maintained, and the industries that had been disturbed were brough back into line. The expectations of continued prosperity during the coming year have been based upon the assumption that with Russian products still out of the competition the demands from western Europe would continue to sustain prices for farm products, and this expectation has been disappointed. It lets down practically one-half of the industrial organization and renders it unable to continue purchases of the other half on the same scale, without a readjustment of the basis on which the exchanges are made.

The farmer has suffered not only a great direct loss of purchasing power, but a shock which will affect his mental attitude toward expenditures for some time. He has debts to pay, more debts than at any previous time, judging from the volume of bank loans, and it will take a great many more products to pay them than it would have taken a year ago or three months ago. It is not to be expected that he will be the free spender in the near future that he has been during the last year.

There is no big surplus of wheat in the world. Allowing for the uncertain character of all crop estimates, for even the figures upon our own crops are only estimates, and allowing also for uncertainty about European consumption, the margin of safety is small. Nobody will really know until about next May or June whether all our wheat will be wanted or not. Meanwhile, the question with each holder or prospective purchaser is whether or not he wants to carry wheat over into the next crop year. The answer to that question determines his attitude. Market opinion is shown by the fact that wheat for March delivery is still about 5 cents per bushel below the December delivery.

The Swing of Business

This slump in business conditions has demonstrated again that the great movements in the business world which make good times or bad times are spontaneous and beyond control. They are due to mass action and mass psychology. The business of the country depends upon the purchases and policies of tens of millions of individuals, and when they become generally possessed of a spirit of confidence, and go ahead with their planning and spending under its influence, we have a period of prosperity. The difference between free spending and careful economy by all the people of this country means a vast difference in the volume of trade and the level of prices.

A state of full prosperity is seldom long maintained because it means a balanced state of industry, and the balance may be disturbed by many influences, originating at home or abroad. The war gave an enormous but unhealthful stimulus to the industries and brought on the rise of wages and prices. Following the war, there was another abnormal period, due to scarcity resulting from the war and the release of demands that had been in restraint. The actual scarcity was exaggerated in many instances, as in the case of clothing and sugar, by an insistent demand which would be supplied at any price. A market in which demand exceeds supply is commonly called a seller's market, on the theory that the seller names the price, but the prices upon many commodities in the latter part of 1919 and early part of 1920 were made by a scramble of buyers and the bidding of dealers eager to supply them. There was a shortage of cloth and of sugar, but the market was over-stimulated by the action of buyers, who in many instances tried to get more than they really wanted in the expectation that the limited supplies would be alloted, or to provide for the future. Nobody was more deceived than the dealers and producers. The price of raw sugar in Cuba went to 23½ cents per pound, and has since dropped to 4¾ cents. The sugar movement was

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an extreme one but that in textiles was of the same kind, and both illustrated the swing of mass purchasing power. It was at its maximum last fall and winter.

Price Structure Top-Heavy

But, as already said, a movement of this kind is not sustained because the buying abilities of all classes of the public do not remain in balance. In the great rise of prices all did not share alike. Those whose incomes did not keep pace with the rise of prices were obliged to curtail their purchases, and as prices went higher the support for them weakened. The spring months were unfavorable to trade, goods did not move normally, the jobbing trade fell off, and with production at a high rate goods were accumulating. Money was tight, middlemen had heavy obligations outstanding and more goods coming, bought for the fall trade. Then came the flood of cancellations and the cutting of prices. The price structure was top-heavy. As confidence in the future of prices was undermined the attitude of the trade and the public completely changed. Nobody would buy except to meet immediate wants, and goods came out from many quarters. When it developed that the orders for fall goods cancelled last May were not to be reinstated, and that Fall needs were readily satisfied in the open market at continually falling prices; and when as the fall advanced the usual buying for spring delivery did not develop, it became evident that confidence would not be restored or prices stabilized until a far-reaching, thorough readjustment of costs and prices had been accomplished.

When Will Confidence Be Restored?

The movement has gone too far in some directions for confidence to be restored or buying stimulated until it has gone farther in other directions. The situation as regards purchasing power is more disorganized and out of balance than it has been at any previous time. The farming population has suffered a loss of purchasing power amounting to somewhere between 30 and 40 per cent, or $6,000,000,000 to $8,000,000,000, as compared with last year. It would be very foolish for the people engaged in the other industries to think that they can go on making and selling goods as though this loss had not occurred, enjoying also the benefit of this reduction in cost of farm products.

Manufacturers, merchants, labor leaders, owners of stocks in railroads and industrial companies—everybody in business—are asking how long this depression which is spreading over industry is likely to last. Nobody can tell the length of time, but it is not difficult to name the principal condition necessary to a revival. The prices of what the farming population wants to buy must come down to correspond with the prices of what it has to sell. Until then the state of reciprocity which is necessary to full employment of labor and general prosperity cannot exist. The equilibrium must be restored. There will be no confidence in the situation until the equilibrium is restored. Merchants are not going to buy goods which they know their customers are unable to buy, railroads will not buy equipment to carry goods which will not be bought, construction work will be at a standstill, enterprise will be dead, until a basis of fair exchange for the products of the industries is reached.

This is not a matter of resolution, resentment, or concerted action. It results from the character of trade relations, from the fact that all business consists of an exchange of services. What one class of producers does not get, it cannot spend. With trade relations out of balance the circulation of goods must be curtailed.

Will Wage Reductions Be Made?

It is said that organized labor is going to stand for the present wage scales. That is a very natural resolution to make, off hand. Nobody likes to take the back track, and nobody should want labor to take the back track in any real sense. A reduction of wages which would put the general wage-level below the new price level would throw the situation out of balance in the same way that the fall of farm products has thrown it out. Neither the farms nor the towns can buy the products of the other except on a basis of fair exchange, and if the products or services of either are unfairly valued the entire industrial system will be disorganized. Wages and farm products went up fairly well together, and it is a mistake to think that they are not coming down together, for they are tied together by the economic law.

It is said that in the principal shoemaking centers of Massachusetts the labor organizations have passed resolutions against any wage reductions and that in the principal textile centers of the same state the mill companies and their employees have come to a similar understanding, for the present. But the news reports from the same cities say that the shoe factories and textile mills are running not over half time, which means a reduction in wages of fully one-half. It is mere fiction to say that wages are not reduced when such conditions prevail, even though wage rates are unchanged.

The shoe-makers and mill operators may think that at least they are better off in that they only work one-half the time, but they overlook their own interest and the interest of the entire laboring population in the cost of shoes and clothing. While they are not actually sustaining their own wages they are keeping up the cost of goods, and if other workers, all around the circle of the industries, do the same, the cost of living will stay up for everybody, with earnings reduced. Of course it will be only fair for the farmers to work half time also, and already they have counsels of this kind. It is impossible to run the industries of this country on half time and produce economically or supply the people with the comforts they want. Any such attempt is destined to break down, because it cannot produce the desired results.

Position of Wage-Earners

We do not believe the wage-earning class will be found obdurate when the situation is understood in all its relations. They do not want to lose any real gains, but there are many signs that they will accept lower pay if the purchasing power of their wages is not reduced. That gives a basis for agreement. An official of the American Federation of Labor is quoted as saying that there must be no reduction below the levels of 1914, with allowance for increases in the cost of living. That sounds all right, but it must be borne in mind that the cost of living is not something imposed upon the wage-earning class from above or from the outside; it is largely dependent upon the wages they insist upon having and their own attitude toward their work. They should not disclaim their proper share of responsibility for the cost of living, or think they can make someone else bear it. Nor can they, any more than any other class, escape their share of the results of ills and calamities that afflict the world. They may say that they are not responsible for the war or the disorganization of industry which has resulted from the war, but these costs must be borne by society as a whole, with every member bearing some share.

On the other hand there are the possibilities that lie in improvements in industry, by which it can be made more effective, production increased and costs reduced. Just as no one in society can escape some share of the effects of great calamities, however they may be caused,

so no one can fail to receive some share of the benefits which result from improvements in the arts and industries. A great corn crop does not benefit the growers or landowners alone; indeed they are thinking now that they have over-done their service to the community, and so it may be unless all the industries give the same honest effort for the general good. The improvement of industry and general increase of production is the true way of progress, and labor can play a great part in the advance. With respect to this also there are signs that it will not be wanting.

Retail Prices an Obstacle to Readjustment

Labor answers the claim that wages should come down to correspond with the fall of wholesale prices, by saying that retail prices, which determine the cost of living to wage-earners, have not come down to any such extent. That it true and on all sides it is being said that the situation is up to the retailer. He is the distributor and it is charged that he is blocking the flow of goods instead of helping it. His excuse is that he has goods which cost him high prices and he wants to work them off without loss before dropping to the new levels. It is to be said in his behalf that the price records of the Bureau of Labor show that retail prices generally lagged behind wholesale prices on the rising market, as they frankly do on the falling market. The report of the Federal Trade Commission on the flour industry, recently issued, shows that during the period 1913-1918 wheat rose 160 per cent, flour at wholesale 146 per cent, and flour at retail 118 per cent.

There was much discussion while prices were rising over the point whether a retailer was justified in basing his prices upon replacement costs, and popular opinion generally held that he was not. We have pointed out in comments upon war time profits that a dealer would need the profits of a rising market to meet the losses of a declining market. The proper basis for prices at all times is replacement costs, for there is no assurance that a dealer can control prices on any other basis. There is no certainty that he can sell goods at what they cost him.

But the fact that a retailer did not promptly follow prices on a rising market will not help him now. He cannot afford to block the procession. The producer has had to come down, regardless of the fact that his crops or his goods were produced on the high level, the jobber has had to take his loss, and the retailer who gets down to the new level as soon as possible will gain by doing so. He will be selling low-cost goods while his slow-going rivals are tied up with the old stocks. The best policy for the merchant at all times is to turn his stock as fast as he can replace it at lower prices. Furthermore, in times like these every man who is a link in the business chain should do his part to accomplish a speedy readjustment and a restoration of confidence. There can be no restoration of confidence until retail prices are in line with producer's prices. This is no time for recriminations about the blame for high prices or large stocks.

Changes in Retail Methods

The situation may result in permanent changes in the methods of retail distribution. The tendency has been toward chain stores and distribution on a large scale by people who buy direct of producers, or through agencies controlled by producers. The present deadlock and inability of producers to make their reductions effective to consumers will stimulate it. More shoe factories are going to have their own retail stores, for the sake of controlling prices to the public. The farmers are aroused over the failure of retail prices upon fruits and other products to come down, and thereby stimulate consumption when products are perishing. Possibly the retailer sometimes gets more blame than is coming to him, but this is a time when it behooves everyone to play the game of co-operation so openly that all can see what he is doing.

Elements of Strength in the Situation

The elements of strength in the situation which we have named heretofore remain, and will become effective when the conditions are right. The main condition is that all along the line costs must come down until confidence in prices is re-established. Confidence will not be re-established in prices that rest upon inflated costs, even though all profits have been eliminated. It will not be re-established in prices that rest upon any artificial support, for all such supports are temporary. Prices may go lower than can be permanently maintained; it is the usual thing in times of reaction that the momentum carries prices too low, just as in times of expansion they are carried too high.

This is pre-eminently a price situation. There is no lack of confidence in the future of business when a basis upon which it can go forward is found. Price fluctuations in recent years have been so wild that the public has become distrustful of all prices. For the moment buyers stand aside and there is little resistance to the downward movement, but of course this is a temporary situation.

The only prices that seem to be really authoritative are those that prevailed before the war, but it cannot be supposed, that in the present state of industry, this level will be generally reached or maintained. Prices that go too low will recover their proper place as the revival spreads.

Construction Work

Construction work has always led the way in recovery from business depression. The difference between good times is largely in the amount of construction work going on, and the strongest factor in the present situation is the amount of work needing to be done. The country by all reports is underbuilt. None of the deficit of the war time has been made good, but last year and this year the country has fallen farther behind, because there is no confidence that present wage rates for mechanics or prices for materials will be sustained in face of general business conditions. With great numbers of people out of employment, and the demand for office space and factory additions falling off, investors are not wanting to put their money into building operations at costs which they believe can be very much lowered a year or so later. But if wages and prices come down, so that building investments look to be safe against later competition there is a vast amount of work to go forward. There is no industry that holds such possibilities of help for the situation as housebuilding, for the materials required would give employment in a great variety of industries.

The railroads have a great amount of work to be done, and need only the encouragement of lower interest rates, which undoubtedly are on the way.

The manner in which the country has borne the great shrinkage in values, the comparatively few important failures, has shown that the business structure is essentially sound. The banks have carried the situation through the credit strain. There will be plenty of credit for a revival of business on a lower level of prices. The business organization is in working order and ready to resume normal operations when conditions are right, which, as we have indicated, will be when retail prices, wages and industrial costs generally have come down to the level reached by the basic raw products.

Why Industries Shut Down

When the mutual dependence which exists throughout industry is seen, the fallacy of the protest against the closing of factories will be understood. It is a superficial view that the shutdowns are simply to maintain or raise prices. The primary reason is that the goods cannot be sold, and that the proprietor either has no confidence in the future market or lacks the capital to pile up goods. In the present situation it is plain that a readjustment of all manufactured goods to a lower basis is necessary to bring them into line with raw materials, food products and the general level of prices. It takes time to accomplish such a readjustment. It cannot be expected that the manufacturer will go on making goods which he knows he will have to sell at a loss. There is a common rule of conduct in such matters, which everybody naturally follows and which is generally sound and in the public interest.

Few concerns have the capital to run long unless the goods are being concurrently sold. The volume of bank loans shows that business is borrowing great sums, much greater at this time than ever before, and it could not increase these loans for the purpose of piling up goods to be sold at a cer-

tain loss. The losses to proprietors are of staggering proportions now, with everybody striving to make them as small as possible. No one can gain in the long run by dissipating the capital which is engaged in carrying on industry, or breaking up established organizations. Bankruptcies mean that works are closed permanently, or until new capital can be found and new organizations are formed, and meantime labor is out of employment. The common interests are served by readjustments which keep all the factors of industry on a harmonious working basis.

The Industrial Court of Kansas has cited seven flour-milling companies before it to answer why they have been operating only part of the time. The markets give the answer. Throughout the present season wheat has been selling for the forward deliveries at heavy discounts below the spot deliveries, as much as 25 cents a bushel. This means that it has been impossible to buy cash wheat and make it into flour for future delivery without loss. Consumers and dealers have been buying flour for immediate needs only, and the mills have run only upon orders. If they had been running full time throughout recent months and storing flour in warehouses, they would all be bankrupt and shut down permanently by this time, and if the Kansas courts were to require that kind of management there would be no more flour-milling in that state.—*The National City Bank of New York.*

Export of Foreign Tools to Germany

(SPECIAL CORRESPONDENCE)

At a recent sitting of the committee for economics of the preliminary "Reichswirtschaftsrat," or national industrial parliament, the application of an American firm with branch offices in Germany was under consideration. The company which had hitherto produced its machines (cash registers) in the United States only has decided to make Germany the center of production for Europe and with this view in mind had applied to the foreign-trade control bureau for a permit to import special American precision tools required for the manufacture of the machines. As the foreign-trade control bureau is chiefly composed of German manufacturers and workers' delegates it was not surprising that the application was flatly refused on the plea that the German industry was fully able to produce tools of the same precision and quality.

Renewed protests by the firm in question have induced the federal ministry for economics to refer this matter to the industrial parliament for consideration which, at the aforementioned sitting, eventually decided to grant the application while laying stress upon the fact that the decision should not be precedential to warrant the granting of import permits to other firms in similar circumstances. The representatives of the home industry drew attention to the fact that the only firm manufacturing cash registers in Germany before the war was the Anker Works at Bielefeld, while Krupps have now also taken up this line as one of their post-bellum products. A member of the government declared that political factors were in no way influencing the decision of the authorities and while the United States was considerably hampering the import of German products, this should be no reason for Germany to follow anything but a strictly internal economic policy in dealing with such questions. In a further statement by the German representative of the American firms a guaranty was given that all parts of cash registers will be made of German raw materials and by German machines and labor, only the above-mentioned precision tools to be imported. It was also stated that Germany was to become the center for manufacture and sales distribution in Europe, including, later on, England; for which country certain alterations of the machines, owing to the different currency, would become necessary.

It will be highly interesting to watch the results of this decision for it is fairly safe to assume that many American and other foreign firms having formerly catered to the German market or having had branch establishments in Germany prior to the war will be encouraged by the attitude of the German Government in spite of the reservations made at the sitting.

In the ensuing discussion on the pros and cons of imports of foreign machinery and other finished products, Privy Councilor Duisberg, director of Farbwerke Bayer & Co., delivered a violent outburst among the alleged unfair treatment of the German industry by Americans. The United States, he complained, is restricting importation of goods which they urgently need; at the same time taking illegal possession of the Bayer products and patents which are turned to competitive weapons against Germany in England.

Texas Co. Issuing "Lubrication" Monthly

The Texas Co. is issuing a monthly magazine called *Lubrication.* This periodical is interesting not only for the material contained in each individual issue but for the plan behind it.

It is the policy of that company to take up in turn the more important industries and after giving a brief outline of the manufacturing processes or the mechanical procedure, to describe the units involved and to discuss the particular or peculiar lubricating problems of these units or their parts.

Some of the industries taken up have been textile manufacture, metal cutting, refrigeration and ice making, cement, sugar refining, rubber manufacturing, compressed air and electric street railways. Other articles in view are on the paper industry, machine tools, hydro-electric developments, steam turbines, marine installations.

While this magazine is sent out free, the company makes a provision that the individual requesting to have this magazine sent to him be professionally interested in the use and selection of lubricants; that is, he must be an engineer, master mechanic, executive of a manufacturing or power using concern, a purchasing agent, or engaged in work of a similar nature. It is published from the New York office of the Texas Co., which is situated at 17 Battery Place, New York.

To Help Employees Build Homes

The Eastman Kodak Co., Rochester, N. Y., has undertaken the creation of a new organization in which the company and its employees will be mutually interested. Its aims are to encourage common-sense saving and home owning by employees. The practical effect will be that the employees will be furnished banking facilities for their savings and a method of obtaining capital to invest in homes. They also will be given the advantage of expert realty advice in the purchase of land. Before the scheme can become operative, it must be approved by the state superintendent of banking. It is understood that the superintendent has made himself thoroughly familiar with the project, and will grant the necessary permit within a few days.

Huston Thompson Chairman of Federal Trade Commission

Huston Thompson, of Colorado, became chairman of the Federal Trade Commission for a term of one year. Mr. Thompson, who was vice-chairman during the past year, succeeds to the chairmanship under the rule of the commission which provides for rotation in the office of chairman among the several commissioners.

Mr. Thompson was first appointed to the commission by President Wilson in December, 1918, to fill an unexpired term, and in December, 1919, was reappointed for a full term of seven years. He served as assistant attorney-general of the United States, in charge of the Court of Claims branch of the Department of Justice.

Australia Makes Own Leather Belting

In line with the enthusiasm at present prevalent in Australia over the program of making everything at home, leather belting is being made locally in sufficient volume, it is said, to take care of most of the demand. Duty on leather belting was increased by the tariff introduced last March from 25 to 40 per cent. Therefore, American belting would apparently have to sell in Australia on quality, in competition with the local product, which would have a price advantage. There is no resistance to the sale of imported articles which serve the purpose better than the local product, and, though probably costly at first, the introduction of American belting should eventually prove profitable.

New Smelting Plant at Rochester

Upon the completion of the addition to the plant of Sarachan & Rosenthal, Inc., Rochester will become a center of the red and yellow brass ingot industry in New York State. This addition, of brick and steel construction 40 x 100 ft., will be equipped with all modern foundry appliances including coke and electric furnaces of large capacity. The cost is estimated at $50,000.

Italy's Trade Situation

The world trade of Italy for the first seven months of this year shows total imports into Italy valued at 9,454,000,000 lire, a decrease of 631,000,000 lire compared with the same period in 1919; and total exports from Italy for the same period were 4,411,000,000 lire, which is an increase of 1,860,000,000 lire over the first seven months of last year. The United States furnished imports to Italy, out of the total, valued at nearly 3,000,000,000 lire; and the United Kingdom, imports to Italy to the extent of about 1,600,000,000 lire. The foregoing figures are based upon the normal rate of exchange for the lire—$0.193. While the Italian trade balance is showing steady improvement, the process is necessarily slow, just as in the situation with all the other countries whose exchange is at an abnormal discount in the United States.

The imports from Italy to the United States during September were valued slightly in excess of $4,000,000, and for the nine months ended September, at about $61,000,000; the imports from Italy to the United States for the corresponding periods of 1919 were valued at approximately $11,500,000 and $33,500,000, respectively. The exports from the United States to Italy were valued as follows: September, 1920, about $29,500,000; September, 1919, about $33,000,000; for the 9 months ended September, 1920, about $277,000,000; for the 9 months ended September, 1919, about $334,250,000.

Restrictions on the importation of motor trucks into Italy have been removed, effective Oct. 29.

At Capanelle, near Rome, the International Farm Tractor Exhibition opened on September 20. Nine types of American tractors were shown. For demonstration purposes, soil conditions, because of lack of rain, could scarcely have been worse. The American machines stood up pretty well, however, but the tests proved, beyond doubt, that light, low-powered tractors are not for Italy during the summer.

American tractors have acted in satisfactory fashion in Italy, but they have not been properly handled, owing to the lack of skill and experience of the soldiers who operated some of the 6,500 American farm tractors which were purchased by the Italian Government.

It is impossible for American tractors to hold their own in Italy without local service stations equipped for the instruction of operators and for supplying spare parts for repairs. The tractor best adapted for the severe soil conditions in Italy is a machine weighing about three tons, developing from 12 to 14-horsepower at the drawbar. Under ordinary conditions, this type should be equipped with three 14-inch plows.

The keenest competition for American tractors is furnished by machines built in Italy. Excellent tractors are made in Turin and Milan, the latter city turning out a tractor closely modeled after a well-known American machine.

There is a substantial market in Italy for American tractors. Out of the 40,000,000 population of the kingdom, 80 per cent get their living, directly or indirectly, from the cultivation of the soil. Increased production of food is the country's vital need, so that the purchase of our improved farm machinery for the cultivation of waste lands would go far toward relieving the food shortage and for providing for the permanent development of the kingdom's agricultural resources. — *Italian Discount and Trust Co. of New York.*

"Old Hickory" to Be Large Manufacturing Center

The Nashville Industrial Corporation, which is composed of business men of Nashville, Tenn., and which purchased from the government the "Old Hickory" Powder Plant at Jacksonville, Tenn., is developing this immense war undertaking into a large manufacturing center, having available immense housing and manufacturing buildings and facilities. The village had a population of 35,000 when the plant was closed in 1918, and is now completely equipped with all necessary public utilities, schools, banks, club houses, etc., and offers many attractive inducements to new industries or those desiring a change in their location.

Dr. John A. Mathews Head of Crucible Steel Co.

Directors of the Crucible Steel Co. of America have organized by the election of the following officers: Horace S. Wilkinson, chairman; Dr. John A. Mathews, president; George E. Shaw, vice-president and treasurer; Gilbert M. Black, vice-president in charge of operations; F. B. Hufnagel, vice-president; J. M. McComb, vice-president in charge of credits; R. H. Illingworth, vice-president; W. R. Joralemon, secretary and assistant treasurer; A. A. H. Niebaum, assistant treasurer; H. F. Kress, assistant secretary and treasurer; H. L. Gellinger, auditor, and D. C. Barry, comptroller.

Dr. John A. Mathews, who moves up from the position of first vice-president of the company to the presidency, has been identified with the company since 1902. His first connection was with the Sanderson Brothers Steel Co., a subsidiary, at Syracuse, N. Y., as metallurgist. Later he was made president of the Halcomb Steel Co., another subsidiary at Syracuse, going to Pittsburgh about a year ago, when he was elected first vice-president of the parent company.

Business Items

The Precision and Thread Grinder Manufacturing Co., manufacturer of the "Multi-Graduated Precision Grinder," has moved its office to 1 South 21st St., Philadelphia, Pa. At this new location it will maintain a machinery display department.

The Chicago Pneumatic Tool Co. announces the removal of its rock drill plant from 864 East 72nd St., Cleveland, Ohio, to the company's Boyer pneumatic hammer plant at 1301 Second Blvd., Detroit, Mich. Location of the company's "Little Giant" air drill plant at 1241 East 49th St., Cleveland, remains unchanged.

The Colonial Foundry Co. of Louisville, Ohio, has increased its capital stock from $50,000 to $235,000. A. Jackson has been elected secretary. A new 60 x 165-ft. brick addition to the present building is under way and with this addition the company expects to increase its output 150 per cent. The Colonial foundry is now making all kinds of gray-iron castings and general job work.

At the special meeting of the stockholders of the Westinghouse Electric and Manufacturing Co., at East Pittsburgh on Nov. 18, an increase in the indebtedness of the company by the sum of $30,000,000 was authorized. Also the stockholders in this meeting voted to authorize an increase in the capital stock of the company from $75,000,000 to $125,000,000.

The Cincinnati Section of the A. S. M. E. observed the fortieth anniversary of the formation of that society with a banquet in the Business Men's Club, Cincinnati. Julian A. Pollak presided.

The Society of Industrial Engineers held its annual convention in Carnegie Music Hall, Philadelphia, Pa., last week. An exhibition of factory equipment and industrial appliances was a feature of the affair.

The Skinner Chuck Co., New Britain, Conn., will shortly increase the capital stock of the company from $225,000 to $750,000.

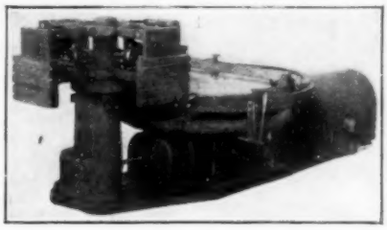
The St. Joseph Structural Steel Co. has moved into its new headquarters and plant, Ninth and Atchison Sts., St. Joseph, Mo., and has increased its capacity considerably by new equipment. Its plant now covers about five acres of ground and is modern in every respect. Most of its business consists of steel in connection with building construction and bridges.

The Louisville Machine and Manufacturing Co., Canton, Ohio, has increased its capital stock from $150,000 to $500,000. The increase was made necessary to take care of the increase in business, according to A. Rodgers, an official of the company. A reorganization will soon be effected in this company.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Grinding Machine, Disk, Continuous-Feed, "No. 24"
Gardner Machine Co., Beloit, Wis.
"American Machinist," Nov. 4, 1920



The machine consists of a horizontal grinding disk, 53 in. in diameter, and four work-tables. The pressure of the work on the disk may be regulated by means of a compression spring. A micrometer screw stop permits grinding to fixed limits. The feeding mechanism can be arranged so that the work-table will make a complete revolution in 1, 2 or 4 min. It is controlled by a friction clutch which enables the operator to stop the feed without stopping the disk. The stand which carries the work-table can be adjusted over a distance of 6 in. The weight crated is 7,600 lb.

Winding Machine, Coil
Charles Eisler, 159 Clifton Ave., Newark, N. J.
"American Machinist," Nov. 4, 1920

The machine is intended for winding the filament coils for gas-filled incandescent lamps and it is claimed that it is capable of winding coils from 25 to 900 turns per inch for lamps of 15 to 1,000 watts. The mandrels used are from 0.003 to 0.035 in. in diameter and can be dissolved in acid after completion of the coil. Coils can be wound close or with any desired spacing. The speed of the machine is from 500 to 3,000 r.p.m. according to the size of the filament to be wound. Coils of 5,000 ft. in one length can be wound and the filament can be electrically heated to a cherry red during the winding.

Grinding Machine, Pneumatic, Series-A
Roto Pneumatic Tool Co., 4700 Train Ave., Cleveland, Ohio
"American Machinist," Nov. 11, 1920

This machine is intended for light grinding and polishing work. The air enters it through the control handle and is applied to the pistons, which are integral with the rotating shaft. The air control is balanced, so that the throttle will stay in any position in which it is placed. The device is free from noticeable vibration and can be easily controlled. Proper lubrication is provided. Under average conditions the air consumption is 15 to 20 cu.ft. of free air per minute at a pressure of 80 lb. per square inch. Either a 6-in. or an 8-in. wheel can be used. The weight of the tool is 14 pounds.

Crane, Portable, "Never Slip" "Hammond"
Barrett-Cravens Co., 169-173 North Ann St., Chicago, Ill.
"American Machinist," Nov. 11, 1920

The hoisting gear consists of a bronze worm-wheel and steel worm inclosed in an oil-tight casing. Besides being locked at all points of travel, the worm gearing permits very close adjustment in the height of the load. Specifications: Made in 6 sizes. Lifting capacities, 2,000 to 7,000 lb. Heights, 6 ft. to 10 ft. 8 in. Amount of lift, 4 ft. 10 in. to 8 ft. 6 in. Overhang, 2 ft. 5 in. to 3 ft. 8 in. Floor space, 3 ft. x 3 ft. 6 in. to 4 ft. 3 in. x 4 ft. 10 in. Weight, 575 to 1,400 lb.

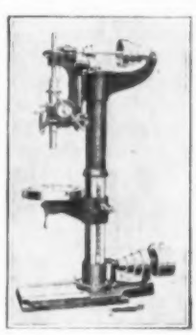
Drill Heads, Multiple-Spindle, Fixed A Center
Roberts Manufacturing Co., 152-56 Brewery St., New Haven, Conn.
"American Machinist," Nov. 4, 1920

The head shown is intended for light work. For heavy duty the case of the head is clamped to the quill of the drilling machine to prevent rotation. Each drill spindle with its driving gear is made of one piece of chrome-nickel steel, the gear having stub teeth. The spindles run in bronze bearings, ball bearings being used to take the end thrust. By using a friction chuck with the head, multiple tapping and stud-setting can be done. The head can be furnished with any desired number of spindles to hold drills up to 1 in. in diameter.

Grinding Machine, Cutter, "Curvex"
Pratt & Whitney Co., Hartford, Conn.
"American Machinist," Nov. 11, 1920

Two features of the machine insure the precision required for grinding formed cutters having helical teeth. The first is an indexing device for successively bringing the teeth in line for grinding instead of holding the back of each tooth against a spring stop. The second is the provision for grinding cutters of different sizes radially without resetting the head or table in any way except in elevation. An accurately mounted diamond tool is provided for dressing the beveled-edge grinding wheel to the correct shape. The machine can be used for either wet or dry grinding.

Drilling Machine, Upright, 22-In., Stationary-Head
Production Machine Tool Co., 629 E. Pearl St., Cincinnati, Ohio
"American Machinist," Nov. 11, 1920



This machine is intended for drilling, boring, tapping and facing holes up to and including 1¼ in. in diameter. The table-elevating worm is located on the right-hand side, and controls are all within easy reach of the operator. Specifications: Capacity, drills to center of 22-in. circle. Spindle speed; back gears in, 20, 33, 53, 88 r.p.m.; back gears out, 117, 196, 318, 530 r.p.m. Power feed per revolution of spindle, 0.006, 0.010, 0.015 in. Distance from spindle to base; maximum, 45 in.; minimum, 35 in. Distance from spindle to round table; maximum, 25⅜ in.; minimum, 9¾ in. Diameter of round table, 18⅜ in. Spindle; diameter, 1 5/16 in.; hole, No. 3 Morse taper; vertical traverse, 10 in. Column diameter, 6 in.

Cutters, Formed, Helical-Flute, "Curvex"
Pratt & Whitney Co., Hartford, Conn.
"American Machinist," Nov. 11, 1920

It is claimed that these cutters can be run at faster speeds and will take heavier feeds than will formed cutters with straight flutes; also that under all operating conditions they will produce a smooth surface free from chatters. The cutters are produced by a single-pointed tool following templet corresponding to the form of the work they are to produce. "Curvex" cutters are only made to order and can be cut with either right- or left-hand helices of practically any lead from 1.607 to 125 in. and with any helix angle up to 20 degrees.

Personals

L. R. FEDLER has been appointed district manager for the Keller Pneumatic Tool Co. in the Milwaukee district, with offices at 915 Majestic Building, Milwaukee. For the past twelve years Mr. Fedler has been associated with the sales organization of the Chicago Pneumatic Tool Co. in the Milwaukee territory.

ALBERT A. DOWD, former president of the Service Engineering Co., Inc., 25 Church St., New York City, has severed his connection with that company and formed a new organization to be known as the Albert A. Dowd Engineering Co., with offices and drafting rooms at 131 West 39th St., corner Broadway, New York City.

S. C. WILSON is now sales engineer in the Pittsburgh office of the Whiting Corporation, 1224 Fulton Bldg., Pittsburgh, Pa., succeeding C. H. Martin. Mr. Wilson has spent the last year and a half at the company's main office and works and is thoroughly familiar with every phase of the Whiting line of manufactures.

A. G. MANEY, assistant to President H. H. Franklin of the Franklin Automobile Co., has been appointed director of distribution, a new position just created. Mr. Maney previous to his connection with the Franklin company was affiliated with the Belleville Chemical Co., the Shaw Insulator Co. and the Wright-Martin Aircraft Corporation.

J. C. NELSON, who is president and general manager of the Empire State R.R., has been elected a vice-president of the Syracuse Washing Machine Corporation, Syracuse, N. Y. He will have charge of production, plant maintenance and purchasing, and will continue as president of the trolley corporation.

E. P. WILLIAMS, formerly with McJunkin Advertising Agency, and later director of field work, Bureau of Market Analysis, Inc., has joined the staff of the Independent Pneumatic Tool Co., manufacturer of "Thor" air and electric tools. Mr. Williams will be located in the general offices, 600 West Jackson Blvd., Chicago, and will have charge of the direct-by-mail advertising and sales promotion department.

C. SEYMOUR WILLIAMS is now southwestern division manager for the Franklin Automobile Co., and is located in Kansas City, Mo.

PETER M. KING, formerly mechanical engineer for the General Petroleum Corporation of Vernon, Cal., is now with the Continental Mexican Petroleum Corporation, Tampico, Mexico.

J. D. JAMES of the Whiting Corporation, Harvey, Ill., has taken up duties as assistant to the company's Buffalo representative, George F. Crivel, 430 Ellicott Square, Buffalo, N. Y. Mr. James has been in the employ of the Whiting Corporation for eleven years in various capacities and is well equipped for the duties of sales engineer.

F. W. TIMSON, who represents the Graton & Knight Manufacturing Co. in Leicester, England, and who has been on a visit to the factory during the month of October, sailed recently on the Carmania for England.

JOHN N. MOWREY, of Philadelphia, Pa., has recently been chosen as the new general manager of the Worcester Pressed Steel Co. of Worcester, Mass., and will assume his new duties Jan. 1.

D. W. FRASER, formerly general manager of the Montreal Locomotive Works, Ltd., is now located in New York City. Mr. Fraser is vice-president of the American Locomotive Co.

EDWARD H. RUCK, who was formerly chief engineer for the Automotive Corporation, Toledo, Ohio, is now general manager of the Mobile Tractor Co., Mobile, Ala.

DEWITT M. TAYLOR has been appointed instructor in mechanical engineering, Massachusetts Institute of Technology, Cambridge, Mass. He was formerly associate editor of *Power*, New York.

C. H. ISRAEL, who was works manager for the National Marine Engineering Works, Scranton, Pa., announces that he has been appointed Eastern representative for the Kingsford Foundry and Machine Works of Oswego, N. Y. Mr. Israel is located in the Philadelphia office of this company.

LEON H. JOHNSON has severed his connection as general manager with the Anderson Foundry and Machine Co. and will in the future be at the head of an engineering firm specializing on oil engine power plants at Anderson, Ind.

C. F. MEYER, assistant secretary of the Landis Machine Co., Waynesboro, Pa., will leave shortly for an extended trip to the Orient.

J. H. PENNINGTON, formerly with the Baltimore Copper Smelting and Rolling Co., Baltimore, is now general manager, McFarland Foundry and Machine Co., Trenton, N. J.

Obituary

LUCIUS J. KNOWLES, president of the Crompton & Knowles Loom Works of Worcester, Mass., largest makers of looms, etc., in the country, died at the Ritz Hotel in London, England, Friday morning, Nov. 26.

Catalogs Wanted

The Indian Tool and Supply Co., Inc., a new company with headquarters at Indianapolis, Ind., wishes to receive catalogs of machinery and equipment.

New Publications

The Practice of Lubrication, an Engineering Treatise on the Origin, Nature and Testing of Lubricants, Their Selection and Use. By T. C. Thomsen, B Sc. (Copenhagen), M I Mech E, formerly chief engineer of the Vacuum Oil Co., Ltd., London 607 pp., 6 x 9, illustrated. Published by McGraw-Hill Book Co., Inc., 239 West 39th St., New York, N. Y.

Mr. Thomsen has written a most comprehensive treatise on lubrication in all its phases and there is no doubt that the men he hopes to reach, according to his preface, will benefit from a careful study of his work. Those mentioned in this category are mechanical and electrical engineers in charge of plant and lubrication, and general consulting engineers, engine builders, oil chemists and manufacturers and chemists employed by oil consumers. There is a British flavor to Mr. Thomsen's book and consequently some American readers may be puzzled for the moment by some of his expressions, but the work as a whole reflects his cosmopolitan experience.

The following chapter headings give a good idea of the scope of the book: I, Mineral Lubricating; II, Fixed Oils and Fats; III, Semi-solid Lubricants; IV, Solid Lubricants; V, Testing Lubricants; VI, The Laws of Friction; VII, Lubricating Appliances; VIII, Bearings; IX, Ring Oiling Bearings; X, Electric Generators and Motors; XI, Plain Thrust Bearings; XII, Ball and Roller Bearings; XIII, Steam Turbines; XIV, Bearing Lubrication of Stationary Open Type Steam Engines; XV, Bearing Lubrication of High-Speed Enclosed Type Steam Engines; XVI, Crank Chamber Explosives; XVII, Bearing Lubrication of Marvel Steam Engines; XVIII, Railway Roller Stock; XIX Electric Street and Rail Cars; XX, Transmission Shafting; XXI, Machine Tools; XXII, Textile Machinery; XXIII, Mine Car Lubrication; XXIV, Steam Engines, Cylinders and Valves; XXV, Blowing Engines and Air Compressors; XXVI, Refrigerating Machines; XXVII, Gas Engines; XXVIII, Gasoline Engines; XXIX, Kerosene Oil Engine and Semi-Diesel Engines; XXX, Diesel Engines; XXXI, Brief Notes on the Lubrication of Various Works and Machinery; XXXII, Oil Recovery and Purification; XXXIII, Oil Storage and Distribution; XXXIV, Cutting Lubricants and Coolants; XXXV, Static Electrical Transformers and Oil Filled Switches.

Elements of Engineering Thermodynamics. By James A. Moyer, Director of the Massachusetts Department of University Extension; James P. Calderwood, Professor of Mechanical Engineering in the Kansas State Agricultural College; and Andrey A. Potter, Dean of Engineering at Purdue University. 216 pp. 6 x 9, illustrated by drawings and diagrams. Published by John Wiley and Sons, Inc., 432 Fourth Ave., New York, N. Y.

This is a text-book for engineering schools and colleges and is well adapted for such needs. It is an enlargement of Moyer and Calderwood's "Engineering Thermodynamics," most of the new material having been supplied by Dean Potter. The subject material is treated under ten chapter headings as follows: I, Thermodynamic Principles and Definitions; II, Properties of Perfect Gases; III, Expansion and Compression of Gases; IV, Cycles of Heat Engines Using Gas; V, Properties of Vapors; VI, Entropy; VII, Expansion and Compression of Vapors; VIII, Cycles of Heat Engines using Vapors; IX, Flow of Fluids; X Applications of Thermodynamics to Compressed Air and Refrigerating Machinery.

Forthcoming Meetings

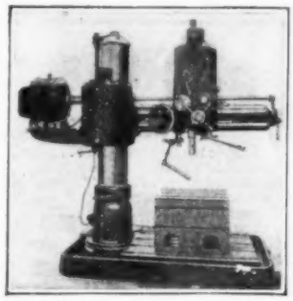
The American Institute of Weights and Measures will hold its annual meeting at 2.30 p.m. in the United Engineering Societies Building 29 West 39th St., New York, Dec. 10, 1920.

The Society of Automotive Engineers will hold its annual meeting on Jan. 11 to 13 inclusive at New York.

Condensed-Clipping Index of Equipment

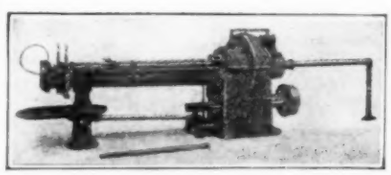
Patented Aug. 20, 1918

Drilling Machine, Radial, 4-Ft., Motor-Driven
Alfred Herbert, Ltd., Coventry, England.
"American Machinist" (European Edition), Sept. 4, 1920



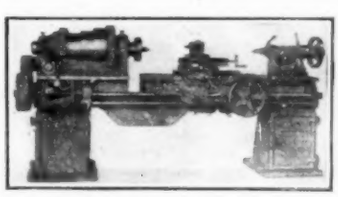
The motor of this machine is so mounted as to balance the arm; the drive is by a shaft which is a prolongation of the motor spindle. Specifications: Capacity, 2½ in. in diameter in cast iron and 2¼ in. in steel. Speeds, 16, ranging from 28 to 547 r.p.m. Feeds, 6, from 31 to 140 rev. per inch. Maximum and minimum spindle distances from baseplate, 5 ft. and 3 in. respectively. Traverse: arm on column, 2 ft. 8 in.; saddle on arm, 3 ft. 2 in.; spindle, 15 in. Minimum distance from spindle to column, 12 in. Spindle hole, No. 5 Morse taper. Baseplate, 4 ft. 4 in. x 3 ft. Floor space, 12 ft. 4 in. x 10 ft. 4 in. Height, 10 ft. 6 in. Weight, 7,500 lb.

Broaching Machine, "Vickers"
Charles Churchill & Co., Ltd., London, E. C., England.
"American Machinist" (European Edition), Sept. 4, 1920



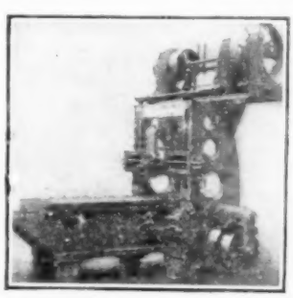
This machine has a capacity for keyways up to 1⅝ in. wide and to broach 3½-in. square holes, the working length of the stroke being 54 in. The cutting speeds are 3 ft. and 6 ft. per minute with return at 35 ft. per minute. The thrust is taken on a roller bearing and the driving screw is 2⅜ in. in diameter by ½-in. pitch, the nut being 9½ in. long. The hole in the faceplate is 6 in. in diameter and the drawhead has a vertical adjustment of 2 in. The length of the stroke can be varied. A 7½-hp. motor is recommended; the floor space is 12 ft. 9 in. x 2 ft., and the weight of the machine, 2,410 lb.

Lathe, Gap, 7½-In. Center, with Quick-Change Feed Box
Colchester Lathe Co., Colchester, England.
"American Machinist" (European Edition), Sept. 4, 1920



This lathe swings work 15 in. in diameter over the bed, 10½ in. in diameter over the saddle and 26 in. in diameter by 7 in. wide over the gap. With a 7-ft. bed it admits 3 ft 2 in. between centers. The bed is 11⅜ in. wide by 8½ in. deep. The spindle is bored 2⅛ in in diameter to admit a 2-in. rough bar. The lead screw is of ¼-in. pitch. The feed box gives 32 thread pitches, ranging from 4 to 60 to the inch, and 32 feeds, ranging from 8 to 120 cuts to the inch. A two-speed countershaft is employed. Weight, 27 cwt.

Planer with Improved Belt-Striking Gear
Cunliffe & Croom, Ltd., Manchester, England.
"American Machinist" (European Edition), Sept. 4, 1920

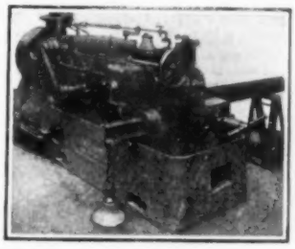


This planer is 6 ft. x 2 ft. 6 in. x 2 ft. 6 in.; the bed is 9 ft. long. The table is 6 ft. x 2 ft. and is traversed in both directions through the same train of gears, the return speed being 2.6 times the cutting speed. This ratio is obtained by suitable pulleys on the countershaft. The self-acting vertical travel of the tool is 7 in. The feed motion is obtained from a rack operated by a friction disk at the side of the machine. The cross-slide is raised or lowered by hand. The machine embodies improved rotary striking motion for reversing the belts silently and without shock.

Gear Generator, Spur
D. Brown & Sons, Ltd., Lockwood, Huddersfield, England.
"American Machinist" (European Edition), Sept. 4, 1920

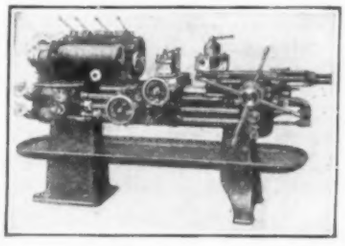
The blank is mounted in this machine on a horizontal table while the cutter is mounted on a reciprocating vertical slide. The cutter has both reciprocating and rotary motions and as its angular velocity is the same as that of the gear blank the process of cutting the gear is one of generation. Capacity, external gears up to 18 in. in diameter by 6 in. face; internal gears up to 24 in. in diameter by 6 in. face; both cases up to 1¼ in. circular pitch or 2½ d.p. Only one cutter is necessary for generating a complete range of gears of any one pitch.

Sawing Machine, Circular, Cold
Alfred Herbert, Ltd., Coventry, England.
"American Machinist" (European Edition), Sept. 4, 1920



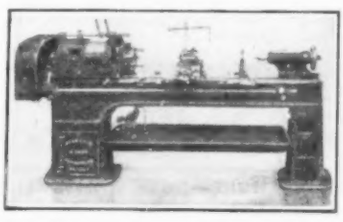
A special feature of this machine is a mechanical chip remover. The machine will cut round bars 6 in. in diameter, squares, 5½ in., and rectangles, 10 x 5 in., or equivalent. The saw is 20½ in. in diameter and has inserted teeth ⅝ in. wide. It runs at 12 r.p.m. The drive is by fast and loose pulleys, 22 in. in diameter for a 3¾-in. belt, and a bracket carries these pulleys and the belt-shifting mechanism. Floor space, 7 ft. 7 in. x 5 ft. 2 in. Weight, 3,360 lb.

Lathe, Combination Turret and Capstan, All-Geared, 7-In.
H. W. Ward & Co., Ltd., Birmingham, England.
"American Machinist" (European Edition), Sept. 4, 1920



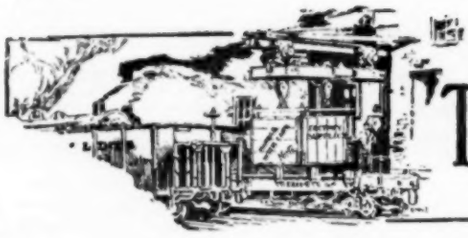
The headstock of this lathe has eight spindle speeds, with reversing motion to all. The spindle has a 2¼-in. bore and the nose is threaded to take a patented or ordinary jaw chuck. The saddle has automatic sliding, surfacing and screw cutting motions, with stops, beside the usual hand motions. A quick-withdraw motion is provided in the saddle, whereby the nut is withdrawn from the lead screw and is applicable either to internal or external threading. The capstan rest is of the usual form and has ten automatic feeds.

Lathe, Screw-Cutting, Automatic
J. Lang & Sons, Ltd, Johnstone, England.
"American Machinist" (European Edition), Sept. 4, 1920



This lathe has a patent bed, and headstock. The tailstock can be set over for taper-turning. The bed is 11¼ in. wide on the face and 10¼ in. on the body and if 6 ft. long admits 2 ft. 4 in. between centers. The height of centers is 6¼ in. The lathe is supplied with an adjustable roller stay and a duplex driver. The machine will swing 4 in. in diameter clear of the slides, and is suitable for threads up to ⅝ in. depth. Beds 6 ft. and 8 ft. long are available; with the smaller, the floor space occupied is 6 ft. by 2 ft. 8 in. and the total finished weight, 26 cwt.

Clip, paste on 3 x 5-in. cards and file as desired



THE WEEKLY PRICE GUIDE

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	Current	One Year Ago
No. 2 Southern	$46.50	$30.35
Northern Basic	40.00	27.55
Southern Ohio No. 2	47.00	28.55
NEW YORK—TIDEWATER DELIVERY		
2X Virginia (Silicon 2.25 to 2.75)	52.40	32.40
Southern No. 2 (Silicon 2.25 to 2.75)	49.16	35.20
BIRMINGHAM		
No. 2 Foundry	42.00	29.25
PHILADELPHIA		
Eastern Pa., No. 2x, 2.25-2.75 sil.	46.00	29.00-30.00
Virginia No. 2	46.25	33.10
Basic	44.00	26.75
Grey Forge	45.50	26.75
CHICAGO		
No. 2 Foundry local	45.00	26.75
No. 2 Foundry, Southern	48.67	28.00
PITTSBURGH, INCLUDING FREIGHT CHARGE FROM VALLEY		
No. 2 Foundry	44.00	28.15
Basic	38.00	27.15
Bessemer	42.00	29.35

* F.o.b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$3.80	$4.15	$3.47	$3.58	$3.37	$3.58	$3.47
Soft steel bars	3.70	4.15	3.37	3.34	3.27	3.48	3.37
Soft steel bar shapes	3.70	4.15	3.37	3.48	3.27	3.48	3.37
Soft steel bands	4.65	5.50	4.07	6.25	....	....	....
Plates, ¼ to 1 in. thick	4.00	4.15	3.67	3.78	3.57	3.78	3.67

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Mill, Pittsburgh	$4.25	$2.77
Warehouse, New York	4.75	3.37
Warehouse, Cleveland	3.52	3.27
Warehouse, Chicago	4.12	3.37

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	New York Current	New York One Year Ago	Cleveland	Chicago
No. 10	3.55-4.50	5.90@6.15	4.57	5.50	6.13
No. 12	3.60-4.55	5.95@6.20	4.62	5.55	6.18
No. 14	3.65-4.60	6.00@6.25	4.67	5.60	6.23
No. 16	3.75-4.70	6.10@6.35	4.77	5.70	6.33
Black					
Nos. 18 and 20	4.20-5.35	7.65@8.00	5.30	6.30	6.90
Nos. 22 and 24	4.25-5.40	7.70@8.05	5.35	6.35	6.95
No. 26	4.30-5.45	7.75@8.10	5.40	6.40	7.00
No. 28	4.35-5.50	7.85@8.20	5.50	6.50	7.10
Galvanized					
No. 10	4.70-6.00	8.05@8.25	5.75	6.75	7.25
No. 12	4.80-6.10	8.15@8.25	5.85	6.83	7.30
No. 14	4.80-6.10	8.15@8.35	5.85	6.85	7.45
Nos. 18 and 20	5.10-6.40	8.40@8.65	6.15	7.15	7.75
Nos. 22 and 24	5.25-6.55	8.55@8.80	6.30	7.30	8.15
No. 26	5.40-6.70	8.70@8.95	6.45	7.45	8.30
No. 28	5.70-7.00	9.00@9.25	6.75	7.75	8.60

Acute scarcity in sheets, particularly black, galvanized and No. 16 blue enameled.

Automobile sheets are unavailable except in fugitive instances, when prices are 9.45c per lb. for No. 16; 9.50 for Nos. 18 and 20, and 9.55c for Nos. 22 and 24.

COLD FINISHED STEEL—Warehouse prices are as follows:

	New York	Chicago	Cleveland
Round shafting or screw stock, per 100 lb. base	$5.50	$5.80	$5.50
Flats, square and hexagons, per 100 lb. base	6.00	6.30	6.00

DRILL ROD—Discounts from list price are as follows at the places named:

	Per Cent.
New York	50
Cleveland	50
Chicago	50

NICKEL AND MONEL METAL—Base prices in cents per pound F.O.B. Bayonne, N. J.

Nickel	
Ingot and shot	43
Electrolytic	45
Monel Metal	
Shot and blocks	35
Ingots	38
Sheet bars	40
Hot rolled rods (base)	42
Cold rolled rods (base)	56
Hot rolled sheets (base)	55
Special Nickel and Alloys	
Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, grades "A" and "C" (base)	72
Copper nickel ingots	42
Hot rolled copper nickel rods (base)	52
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Domestic Welding Material (Swedish Analysis)—Welding wire in 100-lb lots sells as follows, f. o. b. New York: 5/32, 8½c. per lb.; ¼, 8c.; 5/16 to ½, 7½c Domestic iron sells at 12c. per lb.

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	7.00	8.00	9.00
Spring steel (light)	10.00	11.00	12.00
Coppered bessemer rods	9.00	8.00	6.75
Hoop steel	6.00	4.54	5.32
Cold-rolled strip steel	12.50	8.25	10.75
Floor plates	6.25	4.00	6.63

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the Pittsburgh basing card:

BUTT WELD

Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
¼ to 3	54-57½%	41½-44%	⅛	15½-25½%	+1½-11½%
			¼	19½-29½%	1½-11½%
			⅜ to 1¼	24½-34½%	8 -18½%

LAP WELD

2	47 -50½%	34½-38%	1¼	....	....
2½ to 6	50 -53½%	37½-41%	1½	....	....
7 to 12	47 -50½%	33½-37%	2	20½-28½%	6½-14½%
13 to 14	37½-41 %	....	4½ to 6	22½-30½%	9½-17½%
15	35 -38½%	....	2½ to 4	22½-30½%	9½-17½%
			7 to 12	19½-27½%	6½-14½%

BUTT WELD, EXTRA STRONG PLAIN ENDS

¼ to 1¼	52 -55½%	39½-43%	⅜ to 1½	24½-34½%	9½-19½%
2 to 3	53 -56½%	40½-44%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	45 -48½%	33½-37%	1¼	....	....
2½ to 4	48 -51½%	36½-40%	1½	....	....
4½ to 6	47 -50½%	35½-39%	2	21½-29½%	8½-16½%
7 to 8	43 -46½%	29½-33%	2½ to 4	23½-31½%	11½-19½%
9 to 12	38 -41½%	24½-28%	4½ to 6	22½-30½%	10½-18½%
			7 to 8	14½-22½%	2½-10½%
			9 to 12	9½-17½%	5½-+2½%

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
¼ to 3 in. steel butt welded	38%	22%	39%	30%	54@40%	40½@30 %
2½ to 6 in. steel lap welded	33%	18%	41%	26%	50@40%	37½@27½%

Malleable fittings. Classes B and C, banded, from New York stock sell at plus 45%. Cast iron, standard sizes, plus 5%.

METALS

MISCELLANEOUS METALS—Present and past New York jobbers' quotations in cents per pound, in quantities up to car lots:

	Current	Month Ago	Year Ago
Copper, electrolytic	15.00	15.50	22.50
Tin in 5-ton lots	34.50	38.75	56.50
Lead	6.25	6.75	6.25
Zinc	7.00	7.00	7.60
ST. LOUIS			
Lead	6.25	7.25	6.00
Zinc	6.75	6.25	7.15

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

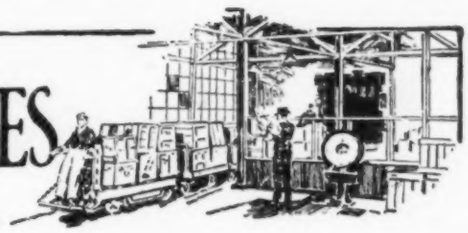
	New York Current	New York Month Ago	New York Year Ago	Cleveland Current	Cleveland Year Ago	Chicago Current	Chicago Year Ago
Copper sheets, base	22.50	23.50	33.50	26.50@29.00	35.50	36.00	36.50
Copper wire (carload lots)	20.00	20.00	30.75	24.00	30.50	29.00	26.00
Brass sheets	22.25	28.50	32.00	28.00	33.00	27.00	28.00
Brass pipe	25.00	28.00	36.00	30.00	39.00	34.00	37.00
Solder (half and half) (case lots)	27.75	29.00	45.00	29.00	41.00	38.00	38.50

Copper sheets quoted above hot rolled 24 oz., cold rolled 14 oz. and heavier, add 2c.; polished takes 5c. per sq.ft. extra for 20-in. widths and under; over 20 in., 7½c.

BRASS RODS—The following quotations are for large lots, mill, 500 lb. and over, warehouse; net extra:

	Current	One Year Ago
Mill	18.25	24.00
New York	19.50	28.00@29.75
Cleveland	25.00	29.00
Chicago	30.00	27.00

SHOP MATERIALS AND SUPPLIES



ZINC SHEETS—The following prices in cents per pound are f.o.b. mill + less 8% for carload lots..... 11.50

	Warehouse			
	—In Casks—		— Broken Lots —	
	Current	One Year Ago	Current	One Year Ago
Cleveland	15.30	12.50	14.70	13.00
New York	14.00	11.50	14.50	12.50
Chicago	14.50	16.50	14.95	16.00

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

	Current	One Year Ago
New York	6.50	9.50
Chicago	7.25	9.75
Cleveland	7.50	9.75

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	—*New York—			
	Current	One Year Ago	Cleveland	Chicago
Copper, heavy, and crucible	12.00	17.00	10.00	11.50
Copper, heavy, and wire	11.50	16.00	9.50	11.00
Copper, light, and bottoms	10.00	14.00	9.00	10.00
Lead, heavy	5.00	4.75	4.50	5.25
Lead, tea	4.00	3.75	3.00	4.00
Brass, heavy	7.00	10.50	7.00	11.25
Brass, light	5.50	7.50	5.00	6.00
No. 1 yellow brass turnings	7.00	10.00	5.50	6.00
Zinc	4.50	5.00	3.50	4.50

*These prices nominal because of dull market

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb	$33.00	$26.00	$33.50

COPPER BARS—From warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York (round)	28.00	32.00
Chicago	27.00	31.00
Cleveland	27.00	35.00

BABBITT METAL—Warehouse price per pound:

	—New York—		—Cleveland—		— Chicago —	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	70.00	90.00	47.00	70.00	45.00	60.00
Commercial	30.00	50.00	18.00	16.50	11.00	13.00

NOTE—Price of babbitt metal is governed largely by formula, no two manufacturers quoting the same prices. For example, in New York we quote the best two grades, although lower grades may be obtained at from $16 to $20.

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	—New York—		— Cleveland —		— Chicago —	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	+$1.25	$1.50	List net	$2.25	+1.15	1.85
Hot pressed hexagon	+ 1.25	1.50	List net	2.25	+1.15	1.85
Cold punched hexagon	+ 1.25	1.50	List net	2.25	+1.15	1.30
Cold punched square	+ 1.25	1.50	List net	2.25	+1.15	1.30

Semi-finished nuts, ⅜ and smaller, sell at the following discounts from list price:

	Current	One Year Ago
New York	30%	50-10%
Chicago	40%	50%
Cleveland	50%	55%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	+10%	30%	20%
Larger and longer up to 1½ in. by 30 in.	Net list	30%	10%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York..... list Cleveland..... $2.50 Chicago..... $1.90

For cast-iron washers, ⅜ and larger, the base price per 100 lb. is as follows:

New York..... $7.00 Cleveland..... $4.50 Chicago..... $5.50

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 6 in. and smaller	+20%	30%	20%
Larger and longer up to 1 in. by 30 in.	+20%	25%	15%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets		Burs	
	Current	One Year Ago	Current	One Year Ago
Cleveland	25%	20%	10%	10%
Chicago	net	20%	net	20%
New York	30%	40%	net	20%

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ⅞ and smaller	20%	40-5%	30%
Tinned	20%	40-5%	30%

Boiler, ½, ⅝, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:

New York..... $6.00 Chicago..... $5.73 Pittsburgh..... $4.50

Structural, same sizes:

New York..... $7.10 Chicago..... $5.83 Pittsburgh..... $4.60

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	$26.00	33.00	35.00
Brass	25.00	30.00	34.00

The prices, of course, vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 1 c.; for lots of less than 75 lb., but not less than 50 lb., 2½c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb., 5c. should be added to base price; quantities from 10-25 lb., extra is 10c.; less than 10 lb., add 15-20c.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ¼-2 in. inclusive in rounds, and ½-1½ in., inclusive, in square and hexagon—all varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $1.50.

LONG TERNE PLATE—In Chicago No. 28 primes from stock sell, nominally, for $9.85 per 100 lbs.

In Cleveland—$10 per 100 lbs.

COTTON WASTE—The following prices are in cents per pound:

	—New York—			
	Current	One Year Ago	Cleveland	Chicago
White	15.00@17.00	13.00	15.00	15.00@17.00
Colored mixed	9.00@14.00	9.00-12.00	11.00	11.00@13.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x20½
Cleveland	55.00	65.00
Chicago	41.00	43.50

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$2.00	$2.00	$1.75
Philadelphia	2.75	2.75	1.75
Cleveland	3.00	3.00	2.50
Chicago	2.00	2.75	2.00

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.50	$3.90	$3.65
Philadelphia	3.65	3.65	3.87
Chicago	4.10	5.00	4.12½

COKE—The following are prices per net ton at ovens, Connellsville:

	December 6	November 29	November 22
Prompt furnace	$ 8.00@$10.00	$ 8.00@$10.50	$11.50@$12.00
Prompt foundry	10.00@ 12.00	10.00@ 12.00	12.50@ 13.00

FIRE CLAY—The following prices prevail:

		Current
Ottawa, bulk in carloads	Per Ton	$8.00
Cleveland	100-lb. bag	1.00

LINSEED OIL—These prices are per gallon:

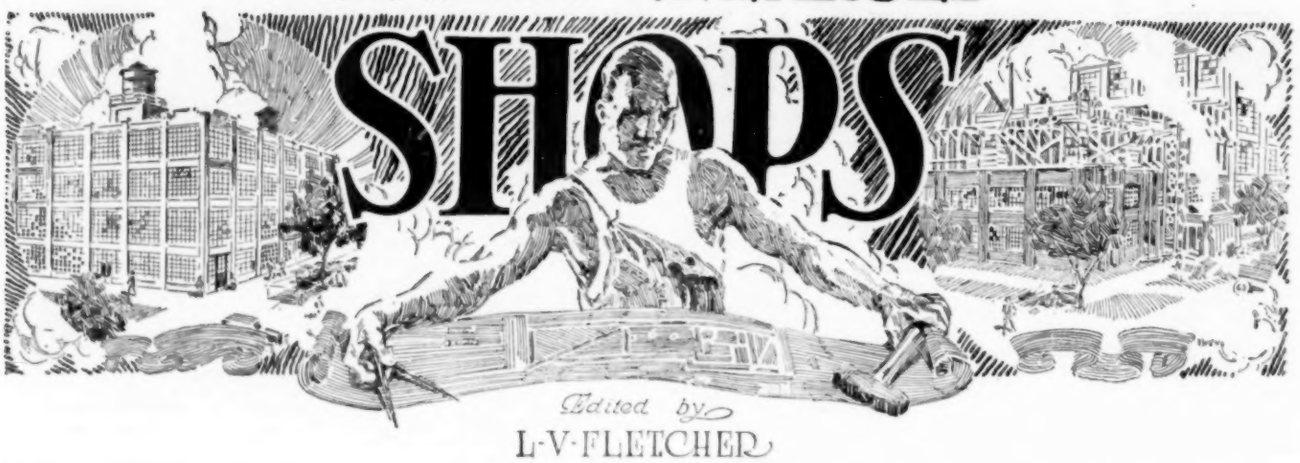
	—New York—		—Cleveland—		—Chicago—	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw in barrels, (5 bbl. lots)	$0.90	$2.15	$1.05	$2.50	$0.97	$2.37
5-gal cans	1.05	2.30	1.30	2.75	1.22	2.57
1-gal cans (6 to case)	1.15	....	....	....	....	....

WHITE AND RED LEAD—Base price per pound:

	Red				White	
	Current		One Year Ago		Current	One Year Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100 lb. keg	14.25	15.75	13.00	14.50	14.25	13.00
25 and 50-lb. kegs	14.50	16.00	13.25	14.75	14.50	13.25
12½-lb. keg	14.75	16.25	13.50	15.00	14.75	13.50
5-lb. cans	17.25	18.75	15.00	16.50	17.25	15.00
1-lb. cans	19.25	20.75	16.00	17.50	19.25	16.00

500 lb. lots less 1% discount. 2000 lb. lots less 10-20½% discount.

NEW *and* ENLARGED



Edited by
L·V·FLETCHER

Machine Tools Wanted

If in need of machine tools send us a list for publication in this column

D. C., Washington—The Bureau of Supplies & Accounts, Machinery Div., Navy Dept.—machine tool equipment for a new submarine destroyer.

N. Y., New York (Borough of Manhattan)—The International Nickel Co., 43 Exch. Pl.—automatic polishing machine for monel metal sheets.

N. Y., Schenectady—The General Electric Co., River Rd.—1 boring mill and 1 drill for its plant at Lynn, Mass.

Pa., Harrisburg—The Belmont Motors Corp., 29 North 2d St.—an adjustable spindle cylinder boring machine.

Pa., Philadelphia—J. G. Boggs, 1910 North 4th St.—one lathe with a 26 in. swing and one lathe with a 32 in. swing.

Pa., Philadelphia—The Pennsylvania Wire Glass Co., Pennsylvania Bldg.—machine tools.

Pa., Redington—The Redington Standard Fittings Co.—9 turret lathes, one 3 ft. radial drill, one 36 in. Bullard vertical boring mill and one No. 12 Grand Rapids grinder.

Va., Richmond—The Amer. Glass Co., Broad and Meadow Sts., C. F. Sauers, Purch. Agt.—lathe and drill press.

Va., Richmond—The Reed Tobacco Co., 21st St., W. F. Reed, Purch. Agt.—machine shop equipment.

Va., Richmond—The Virginia Machinery Well Co., 1319 East Main St.—portable pipe threading machine 4½ to 8 in. and 4½ to 6 in.

Ill., Chicago—The Chicago Metal Mfg. Co., 313 South Clinton St.—metal working equipment including tumbling barrel and nickel plating equipment, etc.

Ind., Connersville—T. A. Parey, 917 Conwell St.—complete machine shop equipment for modern machine shop practice.

Ind., Indianapolis—The Lafayette Motors Co.—one horizontal boring mill, 18 in bed.
Two 42 in. x 8 in. table, 6 heads, planer type milling machine.
One 36 in. x 8 in. table, 6 heads, planer type milling machine.
One 24 in. or 28 in. lathe, 10 ft. bed.
Two vertical milling machines.
One horizontal milling machine No. 2.
Two 3 in. radial drill press with tapping attachment.
One 3 in. x 1½ in. radial drill press with tapping attachment.
One radial tapping machine.
One 22 spindle mill type spindle drilling machine.
One sensitive radial drill.
One 30 spindle multiple spindle drill press.
One 16 spindle rail drill.

Wis., Sheboygan—The Wald Mfg. Co., 18th St. and Martin Ave.—one ⅞ in. x 13 gauge or 38 in. x 15 gauge.

Mich., Detroit—The Amer. Machine Products Co., Howard and 18th Sts.—general machine tool equipment.

Mich., Detroit—The Curran Detroit Radiator Co., 558 Lafayette Blvd.—miscellaneous machine equipment for the manufacture of radiators.

Mich., Detroit—The Street Ry. Comn., 410 City Hall, c/o G. J. Finn, Comr. of Purchases & Supplies, Municipal Courts Bldg.—2 reciprocating rail grinding machines and 2 rotary grinders.

Mich., Detroit—The Zenith Fdry. Co., Miller Ave.—foundry equipment.

Wis., Boscobel—G. L. Hunt Mfg. Co., manufacturers of gear pulling devices, E. Spiegelburg, Purch. Agt.—machine tools.

Wis., Eagle River—F. J. Thrun—machine shop equipment.

Wis., Janesville—The Bower City Machine Co., 211 East Milwaukee St., W. St. Clair, Purch. Agt.—machinery for auto truck repairs.

Wis., Milwaukee—The Amer. Rotator Valve Co., 9th and Chestnut Sts., H. Davischefsky, Purch. Agt.—drill presses, lathes and millers.

Wis., Milwaukee—The Wisconsin Bed Spring Co., 968 Oakland Ave.—additional wire-working machinery.

Ia., Ottumwa—The Wilson Tractor Mfg. Co., 210 East Main St.—milling machines and drill presses.

Ia., Yale—E. W. Child—one used bulldozer.

Que., Montreal—The United Press Co., Notre Dame St., W.—equipment for its proposed plant.

Que., Quebec City—P. A. Beaulieu, 37 Bourlarque St.—$19,000 worth of equipment for his proposed brass foundry.

Machinery Wanted

Conn., Bridgeport—The Connecticut Marine Boiler Wks., foot of Pembroke St.—1 traveling crane with a span of 12 to 20 ft. and a capacity of 6 tons.

Md., Emmitsburg—The Liberty Roller Mills—flour mill machinery to have a daily capacity of 40 bbl.

N. J., New Brunswick—The Arctic Ice Co., 56 French St.—ice machinery, etc.

N. Y., New York (Borough of Brooklyn)—The State Hospital Comn., Capitol, Albany, will receive bids until Dec. 15 for furnishing equipment for the laundry building at the Brooklyn State Hospital, here. Estimated cost, $25,000. L. F. Pilcher, State Archt.

Pa., Chester—The Chester Shipping Co.—one 10 ton steel jib crane.

Pa., Erie—K. O. Schulte, 525 French St., representative for several large manufacturing concerns in Germany, is in the market for the very best and most up-to-date line of machinery and tools for the manufacture of hay and manure forks, wooden handles for forks, ferrules for forks, cotter pins, taper pins, washers, finished and unfinished, and screw machine parts.

Pa., Lewistown—The Pennsylvania Wire Glass Co., Pennsylvania Bldg.—equipment for the manufacture of glass.

Pa., Reading—The W. G. Hollis Candy Mfg. Co., c/o F. Muhlenberg, Archt., Flanders Bldg.—machinery for the manufacture of candy.

Ga., Savannah—The Georgia Ice Co., A. M. Dixon, P. O. Box 1352, Mgr.—100 ton ice making machinery.

Ill., Chicago—The Chicago Wet Wash Laundry, c/o Ronneberg, Pierce & Hauber, Archts., 10 South La Salle St.—laundry equipment.

Ill., Chicago—The Weiland Dairy Co.—dairy machinery.

Mich., Detroit—N. B. Schermerhorn, 65 Moore Pl.—wood turning lathe, medium or large size (used preferred).

O., Cleveland—The Osborn Eng. Co., 2848 Prospect St.—tire making machinery for the plant of the Hudson Tire & Rubber Corp. at Yonkers, N. Y.

O., Columbus—The Crystal Ice Mfg. & Cold Storage Co., 397 West Broad St., C. M. Kinnaird, Genl. Mgr.—coal handling, loading and screening machinery to handle large tonnage.

O., Hooster—The Woodard Machine Co.—one 15 to 30 ton crane with a 40 ft. span or equivalent.

Wis., Jefferson—The Jefferson Rubber Co., C. R. Girton, Purch. Agt.—small traveling crane.

Wis., Kenosha—The Kenosha Ice Cream Co., 493 Elizabeth St.—ice cream and refrigerating machinery.

Wis., Menasha—The Menasha Woodenware Co.—woodworking machinery.

Wis., Oshkosh—The Fuller Goodman Co., City Natl. Bank Bldg., F. A. Fuller, Purch. Agt.—single band-saw mill with horizontal resaw for its planing mill.

Wis., Racine—The Ames Carburetor Co., 1508 Clark St.—1 sand blast machine.

Wis., Rice Lake—S. Hegna and K. Knudson—woodworking machinery.

Okla., Nowata—The Gunther City Coke & Coal Mining Co.—all kinds of machinery used in stripping coal.

Tex., Dallas—The Undertakers Co-operative Casket Mfg. Co., c/o C. F. Weiland Undertaking Co., 517 North Ervay St.—tools for the manufacture of caskets and burial devices.

Que., Montreal—I. Malo, 167 Dufresne St.—$16,000 worth of equipment for refrigeration plant.

Metal Working

NEW ENGLAND

Conn., Hartford—C. H. Leppert, Asylum and Spruce Sts., manufacturers of motors, etc., has awarded the contract for the construction of a 2 story, 41 x 63 ft. plant on Walnut St. Estimated cost, $20,000.

Conn., Windsor—A. W. Lovell has awarded the contract for the construction of a 1 story, 100 x 146 ft. garage on Central St.

Mass., Boston—The T. L. Harkins Machine Co., 44-54 Farnsworth St., plans to build a 2 story, 50 x 100 ft. manufacturing plant on Cambridge St., in the Allston section. Cost between $50,000 and $60,000.

Mass., East Boston (Boston P. O.)—V. Caputo, 121 Liverpool St., has awarded the contract for the construction of a 1 story garage on London St. Estimated cost, $25,000.

Mass., East Walpole—Bird & Son, Inc., plan to build a 1 story, 50 x 200 ft. factory for the manufacture of roofing material, etc. C. T. Main, 201 Devonshire St., Boston, Engr.

Mass., Lynn—A. Attbridge, Marblehead, plans to build a 1 story, 70 x 82 ft. garage on Chestnut St., here. Estimated cost. $35,000. E. E. Earp, 333 Union St., Archt.

Mass., Lynn—S. Ragosa, 16 Whiting St., will build a 1 story garage on Sheppard St. Estimated cost, $20,000.

Mass., South Boston (Boston P. O.)—Sampson & Coleman, 10 Hawley Blvd., Boston, will soon award the contract for the construction of a 1 story, 35 x 115 ft. garage on East 1st St., here. Estimated cost, $25,000. S. S. Eisenberg, 15 Court Sq., Boston, Archt.

Mass., Worcester—N. Nore, 338 Plantation St., will build a 1 story garage on Pond St. Estimated cost, $10,000.

Mass., Worcester—Sleeper & Hartley, Inc., 335 Chandler St., plans to build a 1, 2 or 3 story addition to its wire-manufacturing plant on Chandler St.

R. I., Auburn—The General Fire Extinguisher Co., 275 West Exchange St., Providence, has awarded the contract for the construction of a 2 story, 44 x 60 ft. addition to its manufacturing plant. Estimated cost, $25,000.

R. I., Providence—The Autocar Sales & Service Co., 302 Pearl St., has awarded the contract for the construction of a 3 story, 46 x 79 ft. service station and sales building on Pearl and Rice Sts. Estimated cost, $50,000.

MIDDLE ATLANTIC STATES

Md., Baltimore — The Metal Package Corp., Wolfe and Thames Sts., has had plans prepared for the construction of a tinplate and lithographing plant.

Md., Baltimore—M. Resvito, Gwynn Oak and Liberty Heights Aves., will build a 1 story garage. Estimated cost, $7,000.

N. Y., New York (Borough of Bronx)—The Spring St. Garage Co., c/o F. J. Schefeick, Archt. and Engr., 4168 Park Ave., New York City, will build a 1 story, 100 x 225 ft. garage on Fordham Rd. and Hughes Ave. Estimated cost, $50,000. B. Neiburg, Pres.

N. Y., New York (Borough of Brooklyn)—R. Barman, c/o Springsteen and Goldhammer, Engrs. and Archts., 32 Union Sq., New York City, will build a 1 story garage on Coney Island Ave. Estimated cost, $25,000.

N. Y., New York (Borough of Brooklyn)—The E. W. Bliss Co., 17 Adams St., is constructing a 1 story, 50 x 180 ft. addition to its factory on 54th St. near 1st Ave., to be used as a finishing building for electrical motors. Estimated cost, $25,000.

N. Y., New York (Borough of Brooklyn)—R. Dunbar, c/o M. A. Cantor, Archt. and Engr., 371 Fulton St., will build a 1 story, 75 x 125 ft. garage on 17th St. near 3d Ave. Estimated cost, $35,000.

N. Y., New York (Borough of Brooklyn)—J. Polivnick, 267 Barrett St., will build a 2 story, 95 x 95 ft. garage on South 4th St. between Driggs Ave. and Roebling St. Estimated cost, $125,000.

N. Y., Poughkeepsie—The Walter Motor Truck Co., 243 West 61st St., New York City, has awarded the contract for the construction of a 1 story, 100 x 300 ft. factory on Fulton St. Estimated cost, $100,000.

Pa., Philadelphia—D. Montella, 718 Fulton St., has awarded the contract for the construction of a 2 story, 75 x 75 ft. garage at 625 Christian St. Estimated cost, $10,000.

Pa., Philadelphia — The Pennsylvania Sugar Co., 1037 North Delaware St., has awarded the contract for the construction of a 2 story, 50 x 75 ft. machine shop on Delaware and Shackamaxon Sts. Estimated cost, $25,000.

Pa., Pittsburgh — The Pittsburgh Truck Mfg. Co., 609 Neville St., will build a 2 story, 100 x 100 ft. garage and repair shop on 44th St. along the tracks of the Pennsylvania R.R. Estimated cost, $75,000.

Pa., West Brownsville—J. R. Herbertson, Brownsville, will soon award the contract for the construction of a 2 story, 67 x 73 ft. addition to his garage, here. Estimated cost, $50,000. E. R. Johnson, Uniontown, Archt.

Ala., Birmingham—The Continental Gin Co., 3330 10th Ave., has awarded the contract for the construction of a 1 story, 132 x 400 ft. foundry and a 1 story, 100 x 300 ft. machine shop. Estimated cost, $500,000.

Fla., Titusville — The Superior Motor Wks. is building a plant. J. Neff, Supt.

Ky., Louisville—The Kentucky Iron & Steel Co., Jones and N Sts., plans to build a steel plant. Estimated cost, $550,000. R. W. Tietjen, Pres.

Ky., Louisville — The Southern Wood Products Co., c/o L. Klarer, Jr., Secy. and Treas., 106 North Western Parkway, plans to build an auto body plant. Estimated cost, $100,000.

La., New Orleans—The Marine Iron Wks., 1008-1014 Magazine St., plans to construct a 2 story, 75 x 115 ft. building; first floor will be used as a stockroom, machine and forge shop and upper floor will be used for office purposes. Estimated cost, $75,000. A. J. Krail, Vice-Pres.

W. Va., Wheeling—The Wheeling Axle Co. has awarded the contract for the construction of a 2 story axle foundry on 27th St. Estimated cost, $6,500.

MIDDLE WEST STATES

Ill., Chicago—The Union Bed & Spring Co. has awarded the contract for remodeling a 3 story, 125 x 600 ft. warehouse into factory on 44th and Colorado Sts. Estimated cost, $150,000.

Ind., Indianapolis — The Pioneer Brass Wks., 424 South Pennsylvania St., has had plans prepared for the construction of a 1 story, 75 x 175 ft. machine shop. J. H. Brinkmeyer, Pres. C. Brossman, Engr.

Mich., Detroit—The Zenith Fdry. Co., Miller Ave., will soon award the contract for the construction of a 1 story, 90 x 200 ft. foundry. G. W. Graves, 43 John R. St., Archt.

Mich., Holly—The Wright-Fisher Bushing Corp., 3087 East Grand Blvd., Detroit, is building a 36 x 120 ft. plant, here, for drilling and reaming jig bushings. P. W. Wickson, Dir. of Purchases.

O., Cleveland—The Atlas Fdry. Co., 7275 Shaw Ave., has awarded the contract for the construction of a 1 story, 37 x 45 ft. addition to its foundry. Estimated cost, $25,000.

O., Cleveland—P. Kelley, 14408 Euclid Ave., has awarded the contract for the construction of a 1 story, 40 x 60 ft. addition to its laundry at 12408 Euclid Ave. Estimated cost, $10,000.

O., Cleveland—The Keystone Bolt & Nut Mfg. Co., c/o W. Krejci, 502 Ullmer Bldg., plans to build a 2 story, 50 x 100 ft. factory on East 93d St. Estimated cost, $75,000. Private plans.

O., Cleveland—G. Myers, c/o H. W. Davis Co., 3400 West 122d St., has awarded the contract for the construction of a 1 story, 50 x 100 ft. garage on West 122d St. and Lorain Ave. Estimated cost, $25,000.

O., Cleveland—The Reliable Auto Top & Fender Co. 4310 Carnegie Ave., has awarded the contract for the construction of a 2 story, 88 x 100 ft. garage at 8011 Lake Ave. Estimated cost, $60,000.

O., Cleveland—M. Singer, attorney, Ullmer Bldg., plans to build a 2 story garage and factory on Hamilton Ave. and East 14th St. Estimated cost, $35,000.

O., Warren—The Western Reserve Motor Car Co., Western Reserve Natl. Bank Bldg., has purchased a 200 acre site 3 mi. from here, adjoining the Erie R.R. and the Baltimore & Ohio R.R., and plans to build a plant for the manufacture of high-class automobiles. R. R. Johnson, Pres.

O., Warren — The Youngstown Steel Co. has purchased 425 acres 3 mi. north of here and adjacent to Mahoming Ave., and plans to build a plant for the manufacture of high-grade wrought iron. Estimated cost, $1,000,000. Ultimate cost, $5,000,000. H. Bixler, Realty Trust Bldg., Youngstown, Chief Engr.

Wis., Janesville—The Bowen City Machine Co., 211 East Milwaukee St., has awarded the contract for the construction of a 1 story, 60 x 172 ft. machine shop.

Wis., Milwaukee—P. J. Fischer, 241 Rusk Ave., has awarded the contract for the construction of a 1 story, 45 x 100 ft. garage on Walnut St. Estimated cost, $15,000.

Wis., Milwaukee—The Milwaukee Reliance Boiler Co., 1102 32d St., is having preliminary plans prepared for the construction of a 1 story, 100 x 125 ft. addition to its boiler shop on 32d St. A. D. Koch, Wells Bldg., Archt.

Wis., Milwaukee—The Wisconsin Bed Spring Co., 968 Oakland Ave., plans to build a 1 or 2 story factory.

Wis., Mineral Point—The Fiedler Motor Co., c/o E. C. Fiedler, Proprietor, is having plans prepared for the construction of a 1 and 2 story, 100 x 136 ft. garage on Main and Atwater Sts. Estimated cost, $80,000. H. Kleinhammer, Platteville, Archt.

WEST OF THE MISSISSIPPI

Col., Grand Junction—The Curtis Canning Co. plans to rebuild its plant which was recently destroyed by fire. Estimated loss, $70,000.

Ia., Fort Dodge—The International Harvester Co., 606 South Michigan Ave., Chicago, Ill., has awarded the contract for the construction of a 1 story, 80 x 170 ft. motor truck and service station on 21st St. and 1st Ave., here.

Kan., Leavenworth—The United States Government, Quartermaster Dept., will soon award the contract for the construction of a 2 story, 100 x 250 ft. motor repair building. Estimated cost, $400,000. Private plans.

Minn., Albert Lea—C. C. and R. G. Lang plan to build a canning plant, to include a 3 story, 50 x 70 ft. main building and a 50 x 50 ft. corn husking house, etc.

Minn., Minneapolis—The Apt Investment Co., 225 Marquette Ave., will receive bids about Dec. 20 for the construction of a 2 story, 100 x 100 ft. garage on Nicollet Ave. and 19th St. Estimated cost, $50,000. L. C. Apt, Pres. S. J. Bowler, 617 Phoenix Bldg., Archt.

Mo., Kansas City—The White Co., East 79th St. and St. Clair Ave., Cleveland, O., has had plans prepared for the construction of a 3 story, 120 x 144 ft. auto service station on 28th and Warwick Sts. Estimated cost, $250,000. Watson Eng. Co., Hippodrome Bldg., Cleveland, O., Archts. and Engrs.

Mo., St. Louis—The St. Louis Paper Can & Tube Co., 4400 North Union Ave., will soon award the contract for the construction of a 1 story, 100 x 900 ft. factory on Big Bend Rd. along the tracks of the Missouri Pacific R.R. Estimated cost, $100,000.

WESTERN STATES

Wash., Tacoma—The city plans to build a 2 story, 100 x 200 ft. warehouse, supply and shop building for the Light and Water Dept. Estimated cost, $75,000. I. A. Davidson, Comr. of the Light and Water Dept.

CANADA

Que., Montreal—The United Press Co., Notre Dame St. W., plans to build and equip a plant. Estimated cost, $50,000.

Que., Montreal—The Can Welding Co., Amherst St. near Ontario St., plans to build a plant on St. Timothee St. Estimated cost, $60,000.

Que., Quebec City—P. A. Beaulieu, 37 Bourlarque St., will soon receive bids for the construction of a brass foundry. Estimated cost, $50,000.

General Manufacturing

NEW ENGLAND STATES

Mass., Natick—The Griess Pfleger Tanning Co. of Massachusetts, P. O. Box 271, plans to build a large addition to its leather manufacturing plant. Private plans.

Mass., South Boston (Boston P. O.)—The J. West Thread Co., 297 Congress St., Boston, has awarded the contract for the construction of a 3 story, 60 x 100 ft. addition to its thread manufacturing plant on Covington St. Estimated cost, $75,000.

Mass., Worcester—The Grocers Bread Co., 128 Vernon St., has awarded the contract for the construction of a 1 story, 100 x 125 ft. bakery. Estimated cost, $60,000.

R. I., Pawtucket—The Berry Spring Mineral Water Co., 3 Charlton Ave, has awarded the contract for the construction of a 2 story, 40 x 40 ft. addition to its plant. Estimated cost, $15,000.

MIDDLE ATLANTIC STATES

Md., Ameelle (Baltimore P. O.)—The Amer. Cellulose & Chemical Mfg. Co., Ltd., 681 5th Ave., New York City, has awarded the contract for the construction of a 1 story plant, here. Estimated cost, $200,000.

Md., Baltimore—The Duraflex Co., 213 Courtland St., manufacturers of flooring, has an option on an acre tract on Hollins Ferry Rd. and Eutaw St., and has awarded the contract for the construction of a plant. Estimated cost, $10,000. R. Bogiano, Pres. and Treas.

Md., Baltimore—W. E. Hooper & Sons Co., Parkdale Ave., manufacturer of cotton duck, has had plans prepared for the construction of an addition to its machine department

Md., Baltimore—The Maryland School for the Blind, Overlea, has awarded the contract for the construction of a 2 story, 50 x 94 ft. broom factory on Edmondson and Fulton Aves., here. Estimated cost, $30,000.

Md., Emmitsburg—The Liberty Roller Mills will build a 3 story, 30 x 50 ft. flour mill. Estimated cost, including equipment, $10,000. V. H. Bean, R. F. D. No. 3, Prop. and Constr. Engr.

N. J., New Brunswick—The Arctic Ice Co., 56 French St., has awarded the contract for the construction of a 3 story, 50 x 100 ft. storage plant. Estimated cost, $75,000.

N. Y., L. I., Jamaica—The Metropolitan Tobacco Co., 22 Bergen Ave., is having plans prepared for the construction of a 1 story, 80 x 115 ft. factory on Bergen Ave. and Bergen Pl. Estimated cost, $80,000. Koch & Wagner, 32 Court St., Brooklyn, Archts.

N. Y., New York (Borough of Brooklyn)—The Eclipse Box & Lumber Co., 425 Greenpoint Ave, has awarded the contract for the construction of a 1 story, 200 x 300 ft. factory on Russell St. Estimated cost, $100,000.

N. Y., New York (Borough of Brooklyn)—The Forest Box & Lumber Co., c/o Gilbert & Ashfield, Archts and Engrs., 350 Fulton St, has awarded the contract for the construction of a 1 story, 100 x 140 ft. factory at 420 Oakland St. Estimated cost, $50,000.

N. Y., Tonawanda—The Stanley Steel Welded Wheel Corp., 40 Court St., Boston, Mass., has awarded the contract for the construction of a 1 story, 90 x 200 ft. plant for the manufacture of wheels. Estimated cost, $100,000. Noted Oct. 14.

N. Y., Utica—The Utica Spinning Co., Whitesboro St., has awarded the contract for the construction of a 3 story addition to its factory. Estimated cost, $200,000.

N. Y., Yonkers—The Hudson Tire & Rubber Corp., Proctor Bldg., has awarded the contract for the construction of a 3 story factory on Nepperhan Ave. Estimated cost, $300,000. Noted Sept. 16

Pa., Cresson—The Penn Cress Ice Cream Co. has awarded the contract for the construction of a 50 x 90 ft. ice cream plant. Estimated cost, $50,000. Noted Nov. 11.

Pa., East Liberty (Pittsburgh P. O.)—The Reick McJenkin Dairy Co., 1345 Forbes St., Pittsburgh, has awarded the contract for remodeling and altering a 3 story, 100 x 130 ft. brewery into a dairy plant. Estimated cost, $25,000.

Pa., Lewistown—The Pennsylvania Wire Glass Co., Pennsylvania Bldg., is having plans prepared for the construction of a 1 story, 175 x 600 ft. glass plant. F. A. Hayes, Pennsylvania Bldg., Archt.

Pa., Nanticoke—The General Cigar Co., c/o A. Freeman, Archt. and Engr., 29 West 34th St., New York City, has awarded the contract for the construction of a 3 story, 90 x 155 ft. factory, here. Estimated cost, $140,000.

Pa., Reading—The W. G. Hollis Candy Mfg. Co., c/o F. Muhlenberg, Archt., Flanders Bldg., is having plans prepared for the construction of a 4 story, 20 x 80 ft. candy factory on Plum and Franklin Sts.

SOUTHERN STATES

Fla., Palatka—The United Sugar Corp., 1512 Walnut St., Philadelphia, Pa., will soon award the contract for the construction of a sugar refinery, etc. Estimated cost, $1,000,000. G. P. Anderson, 1512 Walnut St., Philadelphia, Pa., Engr.

Ga., Lafayette—The Consolidated Textile Corp., 11 Thomas St., New York City, plans to build a 2 story addition to its mill. Estimated cost, $150,000. J. E. Sirrine & Co., Greenville, S. C., Archt. and Engr.

Ga., Savannah—The Georgia Ice Co. plans to build a 2 story, 60 x 150 ft. addition to its ice plant. Estimated cost, $35,000. A. M. Dixon, P. O. Box 1352, Mgr.

Ga., West Point—The West Point Mfg. Co., manufacturers of cotton goods, plans to construct a picker building, opener room and machine shop to cover 60,000 sq.ft. of floor space. Estimated cost, $200,000. L. W. Rabert, Candler Bldg., Atlanta, Engr.

Ky., Louisville—The Natl. Candy Co., c/o Brodes & Theens, 829 South Flyod St., plans to build an addition to its plant. Estimated cost, $1,000,000.

La., New Orleans—G. B. Matthews & Son, 412 South Front St., wholesale dealers in feed, are having plans prepared for the construction of a mixed feed factory and a warehouse on the square bounded by Cortez, Telemachus and Scott Sts. Estimated cost, including equipment, $250,000. M. H. Goldstein, 305 Baronne St., Archt.

N. C., High Point—The city plans to build an abattoir. Estimated cost, $25,000.

N. C., Raleigh—J. L. Dorming, c/o The Raleigh Ice & Cold Storage Co., plans to build a wholesale ice manufacturing plant and cold storage house on West Hargett St. Estimated cost, $100,000.

S. C., Beaufort—The Seacoast Packing Co. has awarded the contract for the construction of a 3 story, 85 x 110 ft. packing plant. Estimated cost, $100,000.

MIDDLE WEST

Ill., Chicago—The Chicago Wet Wash Laundry, c/o Ronneberg, Pierce & Hauber, Archts., 10 South La Salle St., has awarded the contract for the construction of a 2 story, 64 x 152 ft. laundry. Estimated cost, $65,000.

Ill., Chicago—The Turner Mfg. Co., 1444 South Sangannon St., manufacturer of picture frames, plans to build a 2 story, 100 x 180 ft. factory on 42nd and Ogden Sts. Estimated cost, $200,000. A. S. Alshuler, 28 East Jackson St., Archt.

Ill., Chicago—The Weiland Dairy Co. has awarded the contract for the construction of a 1 and 2 story, 140 x 150 ft. dairy at 3014-28 5th Ave. Estimated cost, $125,000.

Mich., Detroit—The Bd. Educ., 50 Bway., will receive bids until Dec. 21, for the construction of a 5 and 7 story, 250 x 350 ft. technical high school, on 2nd Ave. and High St. Estimated cost, $2,500,000. Malcolmson, Higginbotham & Palmer, 405 Moffat Bldg., Archts.

O., Cleveland—The City Ice Delivery Co., Cadillac Bldg., plans to build a 1 story ice manufacturing plant on Saranac Rd. Estimated cost, $50,000. C. C. Coneby, c/o owner, Archt and Engr.

O., Cleveland—The Cleveland Folding Bed Co., 2554 East 55th St., has awarded the contract for the construction of a 2 story, 70 x 70 ft. factory at 3740 Central Ave. Estimated cost, $40,000.

O., Cleveland—H. Horben, 4918 Denison Ave., has awarded the contract for the construction of a 1 story, 23 x 25 ft. bottle cleaning plant. Estimated cost, $5,000.

O., Cleveland—The Natl. Carpet & Rug Mfg. Co., 1971 West 50th St., will soon award the contract for the construction of a 2 story, 40 x 120 ft. factory on Lorain Ave. Estimated cost, $75,000. Whitworth & Johnson, 413 Engineers Bldg., Archts. Noted Dec. 2.

O., Cleveland—The Telling Belle Vernon Co., c/o W. E. Telling, 3825 Cedar Ave., plans to alter its dairy plant on Eagle Ave. Estimated cost, $100,000. Christian Schwarzenberg & Gaede, 1900 Euclid Ave., Archts. and Engrs.

O., Cleveland—The Jennings Sanitary Milk Bottle Co., 5110 Detroit Ave., is building a 1 story, 20 x 30 ft. factory at 5115 Tillman Ave. Estimated cost, $5,000.

O., Cleveland—A. Kovacks, 2641 East 130th St., is building a 1 story, 30 x 34 ft. sausage factory at 11105 Buckeye Rd. Estimated cost, $5,000.

O., Cleveland—The Natl. Carpet & Rug Mfg. Co., 1971 West 50th St., is having plans prepared for the construction of a 2 story, 40 x 123 ft. factory on Lorain Ave. Estimated cost, $50,000. Whitworth & Johnson, 413 Engineers Bldg., Archts.

O., Dayton—The Miami Ice Delivery Co., Ludlow Bldg., has awarded the contract for the construction of a 1 story, 60 x 60 ft. ice plant. Estimated cost, $50,000.

Wis., Appleton—The Fox River Paper Co. has awarded the contract for the construction of a 2 story, 26 x 165 ft. paper mill.

Wis., Glidden—The Northern Wood Products Co. plans to build a 2 story, 85 x 110 ft. factory on Main St. for the manufacture of brooms. Estimated cost, $55,000. W. A. Thomas, Pres.

Wis., Kenosha—The Kenosha Ice Cream Co., 493 Elizabeth St., is having plans prepared for the construction of a 2 story, 46 x 75 ft. factory on Grand Ave. C. Augustine, Kenosha, Archt.

Wis., Kewaunee—The Wisconsin Shipbuilding & Navigation Co. plans to construct additional buildings. Estimated cost, $200,000. J. W. Barber, 345 35th St., Milwaukee, interested.

Wis, LaCrosse—The Mathews Mfg. Co., c/o W. Matthews, Rocky River, O., plans to build a 2 story, 125 x 300 ft. veneer factory, here. Estimated cost, $100,000 Private plans.

Wis., Sheboygan—The Hand Knit Hosiery Co., 14 Huron St., plans to build a 2-4 story 60 x 250 ft. addition to its factory on 14th St. Estimated cost, $100,000. H. Chesebro, Pres.

WEST OF THE MISSISSIPPI

Col., Denver—W. N. Bowman Co., Archts., Central Savings Bank Bldg., is preparing plans for the construction of a 6 story, 125 x 150 ft. physicians building and a 2 story garage and filling station on East 17th Ave. and Bway. Estimated cost, $1,000,000. Owner's name withheld. Simm Finance Co., leasee.

Col., Wellington—The Du Pont Sugar Co., 627 19th St., Denver, has awarded the contract for the construction of a sugar factory, here, to have a daily capacity of 600 tons. Estimated cost, $1,000,000.

Kan., Baxter Springs—The General Amer. Oil Co., 604 New 1st Natl. Bank Bldg., Tulsa, Okla., will build a 1 story oil refinery and lubricating works, here. Estimated cost, $100,000.

Mo., Aurora—The Juvenile Shoe Co., Advertising Bldg., St. Louis, has awarded the contract for the construction of a 2 story, 40 x 125 ft. factory. Estimated cost, $35,000. Noted Sept. 2.

Tex., Dallas—The Undertakers Cooperative Casket Mfg. Co., c/o C. F. Weiland Undertaking Co., 517 North Ervay St., is having plans prepared for the construction of a coffin factory. Estimated cost, $300,000.

SEE SEARCHLIGHT SECTION

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